UNIVERSIDAD DE OVIEDO

Doctoral Dissertation

Programa de Doctorado en Educación y Psicología regulado por el Real Decreto 99/2011

COMPONENTIAL ANALYSIS OF SELF-REGULATED STRATEGY INSTRUCTION IN WRITING: ONLINE INSTRUCTION AND ASSESSMENT

ANÁLISIS COMPONENCIAL DE LA INSTRUCCIÓN ESTRATÉGICA Y AUTORREGULADA EN ESCRITURA: INSTRUCCIÓN Y EVALUACIÓN ON-LINE

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AGRADECIMIENTOS

"De todos los conocimientos posibles, el más sabio y útil es conocerse a sí mismo". Con esta cita de William Shakespeare, en el año 2015, comencé a escribir el primer borrador de uno de mis trabajos sobre metacognición. Desde entonces y hasta la fecha, ha sido un proceso de aprendizaje continuo en dos direcciones: a lo ancho, ampliando mis capacidades y habilidades y, en lo profundo, esto es, la calidad y el nivel de las mismas. Cierro esta etapa de mi vida con una lección vital sobre autoconocimiento y autocomprensión. Ya solo por eso, este camino ha merecido la pena.

A nivel académico quiero expresar mi gratitud a las personas cercanas (sabéis quienes sois), hemos hecho el camino juntos. Pero también a las personas que no he conocido y que mostraron interés en mi trabajo y mi labor como investigadora. Sus "Major Revisions" me han guiado hasta la cima.

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Hay un dicho estadounidense que dice así: "*when the going gets tough the tough get going*" que quiere decir: cuando las cosas se ponen difíciles, los fuertes se lanzan a la carga. Esta tesis doctoral es el resultado de la persistencia, el coraje y la determinación.

Yo me celebro y yo me canto (W. Whitman)

PREFACE

This doctoral thesis has been developed at University of Oviedo within the Doctoral Program in Education and Psychology (Programa de Doctorado en Educación y Psicología de la Universidad de Oviedo) regulated by Royal Decree 99/2011 (Real Decreto 99/2011).The doctoral thesis has been covered by a predoctoral grant (Beca de Formación del Personal Investigador– FPI) awarded to the PhD candidate by the Spanish Ministry of Economy and Competitiveness (Ministerio de Economia y Competitividad, grant reference: FPI-BES-2016-076864.).

This doctoral thesis is framed within the research line on analyzing and exploring the effectiveness of the strategy-focused program CSRI (Cognitive Self-Regulation Instruction) in 4th grade students (CSRI program was designed by Dr. Raquel Fidalgo and Dr. Mark Torrance to improve 6th grade student writing skills; see review Fidalgo & Torrance 2017). This line of research has been funded by the Spanish Ministry of Economy and Competitiveness (Ministerio de Economía y Competitividad) through the concession of a competitive project (Reference: EDU2015-67484-P MINECO/FEDER), awarded to Dr. Fidalgo for the period 2016–2020.

This doctoral thesis is structured in nine chapters: the main aim of the first chapter is to provide a general overview that frames the research work included in this doctoral thesis. The second chapter presents the aims of the doctoral thesis. The thesis has three main aims that were operationalized in two empirical studies and two reviews of literature. Chapters third to seventh present each of the studies that comprise this doctoral thesis. Each chapter provides: a specific framework, method, results, conclusions, and limitations. Finally, the last chapter provides the general discussion and conclusions of the doctoral thesis and its limitations. The sections of each chapter followed the APA guidelines (APA, 2020) about scientific publications and/or the journal requirements.

CONTENT

Abstract

The present thesis comprises three main objectives, aiming to improve the written competence of 4th grade students.

The first objective analyzes the effect of the different instructional components of the Cognitive Self-Regulation Instruction (CSRI) program focused on planning process for the improvement of the written competence of 4th grade students. To this aim, an empirical study was carried out. This has been published in the journal *Metacognition and Learning*. In this research, six 4th grade classes of Primary Education (N = 126) were randomly allocated to the experimental conditions which differed in the order in which the instructional components were implemented: Direct Teaching, Peer-Practice, and Modelling (Experimental Condition 1, n = 47); or Modelling, Peer-Practice, and Direct Teaching (Experimental Condition 2, n = 36). A control condition (n = 43) was also included. Writing performance was measured through compare-contrast writing tasks (genre that was focus of the instruction) and by writing opinion texts (transfer task). The efficacy of the strategy-focused instruction was assessed at 5 time points: pretest/posttest, after each component (test 1 and test 2) and follow-up. Writing performance was assessed through the anchor text procedure. Findings supported the efficacy of strategy-focused instruction after four sessions of the CSRI program. Experimental conditions 1 and 2 showed a significant gain relative to the control condition and were equally effective. The Peer-Practice component was associated with the largest learning gains. Finally, in relation to the transfer results, again, both experimental conditions demonstrated a significant gain in relation to the control condition, without differences between them.

The second objective is to analyze the effect of the Cognitive Self-Regulation Instruction (CSRI) program focused on the textual product compared to another that additionally includes explicit instruction in the planning process for the improvement of the written competence of 4th grade students. This objective was addressed through an empirical research which has been published by the journal *Reading and Writing.* In this study, nine 4th grade classes of Primary Education (N = 215) were randomly allocated to two forms of strategy-focused program CSRI. The full-CSRI (experimental condition 1, n = 72) taught students a strategic approach to set appropriate product goals along with planning strategies. However, in the brief-CSRI (experimental condition 2, n = 69), the direct teaching of planning procedures was removed. These two experimental conditions

were compared with a control condition (n = 74). We used a pre-test/posttest design with follow-up. Writing performance was holistically evaluated through reader-based measures. The results demonstrated that only the full-CSRI condition wrote better compare–contrast texts than the control group in both the short and long-term timepoints.

Finally, the last objective is to analyze the published research on new technologies and writing instruction. This objective was addressed in two reviews of the literature: the first review was published in the editorial *Nova Science Publisher* and analyzed the effects of different technological tools for teaching each of the processes involved in writing (planning, transcription and revising). The second review has been published in the journal *Papeles del Psicólogo* and investigated the effects of Intelligent Tutoring Systems (ITS). While it is true that the potential of ITS is clearly supported by the results of the review, the type of feedback provided by the system, together with certain contextual variables, play a crucial role as well as mediator of the results.

Resumen

La presente tesis doctoral comprende tres objetivos principales cuyo propósito es mejorar la competencia escrita del alumnado de 4º de Educación Primaria.

El primer objetivo trata de analizar el efecto de los diferentes componentes instruccionales del programa de instrucción estratégica y autorregulada CSRI (Cognitive Self- Regulation Instruction) focalizado en la planificación textual. Para ello, se llevó a cabo un estudio que ha sido publicado en la revista *Metacognition and Learning*. En este estudio seis clases de cuarto de Educación Primaria (N = 126) se asignaron aleatoriamente a dos condiciones experimentales: enseñanza directa, práctica entre pares y modelado (condición experimental 1, n = 47); o modelado, práctica entre pares y enseñanza directa (condición experimental 2, n = 36). También se incluyó una condición de control (n = 43). El rendimiento se midió mediante la escritura de textos de comparación-contraste (tipología foco de instrucción) y mediante la escritura de textos de opinión (tarea de transferencia). La eficacia del programa se evaluó en cinco puntos de tiempo: pretest/posttest, después de cada componente (test 1 y test 2) y seguimiento. Para la evaluación de los textos se utilizó un procedimiento de texto anclaje. Los resultados revelaron la eficacia del programa de instrucción estratégica CSRI después de cuatro sesiones. Las condiciones experimentales 1 y 2 mostraron una ganancia significativa en relación con la condición de control y fueron igualmente efectivas. El componente de práctica entre pares se asoció con las mayores ganancias de aprendizaje. Los resultados

de la tarea de transferencia mostraron que tras las seis sesiones de CSRI, ambas condiciones experimentales tuvieron una ganancia significativa en relación con la condición de control, sin diferencias entre ellas.

Por su parte, el segundo de los objetivos pretende analizar el efecto de la instrucción estratégica y autorregulada CSRI focalizada en el producto textual frente a otra que incluye adicionalmente instrucción explícita en el proceso de planificación. Este objetivo se concretó en un estudio que ha sido publicado en la revista *Reading and Writing.* En este estudio nueve clases de cuarto de Educación Primaria (N = 215) fueron asignados al azar a dos formas del programa CSRI: CSRI-completo (condición experimental 1, n = 72) que enseñó a los estudiantes un enfoque estratégico para establecer objetivos de productos adecuados junto con estrategias de planificación; CSRI-breve (condición experimental 2, n = 69), en la que se eliminó la enseñanza directa de los procedimientos de planificación. Estas dos condiciones experimentales se compararon con una condición de control (n = 74). Se utilizo un diseño pretest/posttest con seguimiento. El rendimiento se midió mediante la escritura de textos de comparación-contraste. Para la evaluación de los textos se utilizó las medidas basadas en el lector. Los resultados demostraron que solo la condición de CSRI-completo escribió los mejores textos de comparación-contraste con respecto a la condición de control, tanto a corto como a largo plazo.

Finalmente, el tercer objetivo trata de analizar la investigación publicada sobre nuevas tecnologías e instrucción en escritura. Este objetivo se concretó en dos revisiones de la literatura: la primera revisión, publicada en la editorial *Nova Science Publisher*, analizó los efectos de la tecnología según el proceso de escritura apoyado (planificación, transcripción y revisión). La segunda revisión ha sido publicada en la revista *Papeles del Psicólogo* e investigó los efectos de los Sistemas de Tutoría Inteligente (STI). Si bien el potencial de los STI está claramente respaldado por los resultados de la revisión, el tipo de feedback proporcionado por el sistema junto con ciertas variables contextuales, juegan un papel crucial y mediador de los resultados.

CHAPTER 1: GENERAL OVERVIEW ON STRATEGY-FOCUSED INSTRUCTION IN WRITING

Introduction

Writing skills constitute a fundamental condition in order to participate fully in an increasingly digitalized society, text-based and complex information's world. More than 85% of the population of the world (Graham, 2019) can now write for different purposes (Graham, 2018a), for example, as a tool for learn new knowledge (Graham & Hebert, 2011), as a therapeutic tool to express feelings (Pennebaker, 2004) or to entertain. The European Union considers literacy skills (oral and written communication) as the first of the eight key competences, which makes it, therefore, the central focus of the Primary Education curriculum (Education Council, 2006). Due to the importance and versatility of writing, people who do not learn to write well may be their academic and personal achievements limited (Graham, 2019). Therefore, the analysis and study of writing, that is, understanding how the person achieves their learning and mastery, with the aim of to promote its adequate acquisition, is more than justified. Even more, if we take into account that different reports have pointed out students' low writing performance (below of the required standards of achievement) across the globe (e.g., Festas et al., 2015; Ministry of Education, 2011; Queensland government, 2018; United States (NCES, 2012).

To understand why students' difficulties in learning writing occur (Swanson, 2013), it is necessary to know the cognitive processes involved in their mastery (e.g., Berninger & Winn, 2006; Hayes, 2012; Wagner et al., 2011). At this respect in the last decades, and from a cognitive perspective, there are several models that have emerged which explain the development and conceptualization of writing (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006; Graham, 2018a; Hayes, 1996, 2012; Kellogg, 1996). These models ranged from the initial descriptions about the mechanisms involved in writing (Hayes & Flower, 1980), as well as models that describe differences between expert and novel writers (Bereiter & Scardamalia, 1987) to more complex models that propose that writing is simultaneously shaped for both, the characteristics of the communities in which it takes place and by the cognitive characteristics of the person who produce it (Graham, 2018a). From these studies, it is possible to conclude that acquiring adequate written competence is a challenge. This is because writing has multidimensional nature (Rijlaarsdam & Couzijn, 2000) that involved several demanding cognitive activities: planning (explore the topic, structure and organizing the content); transcription (grammatical encoding and retrieving syntactic and semantic knowledge)

and, revising (e.g., Graham, 2018a; Hayes, 2012). To carry out these cognitive processes, it is essential the executive control and the deployment of self-regulation skills (e.g., goal setting, self-evaluation, self-instructions). This is in order to control and monitor which processes occur and when (Graham 2018a; Kellogg, 2008; 2018). Given the complexity of writing, it is not surprising that novice or young writers have problems to achieve quality writing (Kellogg 2008). This problem is greater even if the student does not have sufficiently automatic transcription skills because they devote most of their cognitive resources to text production (e.g., word choice, spelling, sentence construction), so fewer resources are available for fundamental processes such as planning or revising (Rijlaarsdam et al., 2011). At this respect, researchers who have explored the processing time devoted to writing processes in upper-primary, have shown that the role of planning and revising was minimal and the use of these cognitive processes was inefficient (e.g., Limpo et al., 2014; López, et al., 2019). Thus, in this context, there is no doubt about the importance the development and validity of instrucctional practices that support the process of learning to write and providing guidance to teachers. The following section present the most prominent instructional approach to help young writers manage composition, that is, strategy-focused instruction.

Strategy-focused Instruction

In the last decades numerous meta-analysis of true-and quasi-experiments has been emerged with different population (students with and without learning disabilities) (Gillespie & Graham, 2014), and in different educational stages (Graham & Perin, 2007; Graham et al., 2012; Rogers & Graham, 2008). From these meta-analyses it is possible to conclude that strategic-focused instruction is the most effective approaches for achieving management of writing skills; alone or combined with self-regulation procedures (Graham & Harris, 2017). Self-regulatory procedures during writing (e.g., planning and goal setting, and subsequently self-monitoring the progress towards these goals) are essential to producing good text (e.g., Palermo & Thomson, 2018; Rosário et al., 2019; Saddler et al., 2019). The most notable instructional approach that combines strategy-focused instruction and self-regulated procedures is Self-Regulated Strategy Development (SRSD) (Harris & Graham, 2017). The ultimate goal of strategy-focused instruction in general and SRSD in particular is for students to learn to use strategies for carrying out one or more writing processes (planning, transcription and revising) across time or situations (MacArthur, 2017). These strategies include process knowledge about,

for example, planning so that students establish procedural goals ("The first thing I have to do is plan my text, first I will make an outline of the ideas"), and discourse knowledge to ensure that students engage in product goal setting ("what should I include to make sure my text is adapted to audience needs?") (e.g., Graham et al., 2012).

Componential analysis of strategy-focused instruction

Strategy-focused instruction is not a single technique, it has a multicomponent nature (Fidalgo et al., 2017; MacArthur, 2017) which combines different instructional methods identified as effective evidence-based practices (e.g., Graham et al., 2012; Koster et al., 2015): (a) *Direct teaching* knowledge focusing on planning and/or reviewing, and knowledge about setting appropriate product goals for what the final content should be. Both types of knowledge are supported by strategies and mnemonics; (b) *Modelling* with Think aloud by the teacher who provides examples of these procedures and strategies in front of the class; and (c) *Peer or individual practice* for students to emulate and practice these processes in a supportive context where the instructor guides and encourages them to achieve autonomy in writing (Graham et al., 2013). This multicomponent nature prevents us from understanding which of these instructional components or what combination of them is key for achieving better results in writing instruction (Brunstein & Glaser, 2011; De la paz 2007). Identifying the main components and the most effective combinations of components could make it easier to include strategy-focused instruction in the normal curriculum. At this respect, it is important to note that teachers rarely adopt this practice for reasons of time (Graham, 2019), the number of students in the class, or the challenge associated with the implementation of such an unusual component as modelling (without the support of researchers; Kistner et al., 2010). In this context, some researchers have explored and compared the efficacy of different instructional components such a modelling and direct instruction (Fidalgo et al., 2015; López et al., 2017), peer practice (e.g., De Smedt & Van Keer, 2018; Yarrow & Topping, 2001). Moreover, other studies have focused on explore the inclusion of different instructional content such a self-regulation procedure (Graham & Harris, 1989; Sawyer et al., 1992) or procedural knowledge such a planning (Fidalgo et al., 2015).

Cognitive self-regulation instruction program (CSRI)

A prototypical example of strategic and self-regulated instruction is the program called CSRI (Cognitive Self-Regulation Instruction; Fidalgo & Torrance, 2017). CSRI was based on SRSD (Harris & Graham, 2017) and Zimmerman's Model (2000). The

purpose of this program is to promote in students a self-regulated control of the writing process. This involves students internalization of both specific cognitive strategies and knowledge of written discourse (characteristics that are required for quality text); This knowledge must be applied flexibly and independently by students in order to meet the aims and specific requirements of the writing task. To achieve this objective, CSRI comprises the three instructional components or instructional techniques previously mentioned (direct teaching, modelling, and peer-practice) that are sequentially implemented (see for more detail chapter 3 and 5).

The efficacy of the CSRI program has been corroborated mainly with 6th grade primary school students in regular classroom contexts, not only in the short-term period (e.g., Fidalgo et al., 2011; Fidalgo et al., 2015; López et al., 2017), but also two years after finishing the intervention (Torrance et al., 2008). Moreover, these studies have focused on exploring and comparing the efficacy of the instructional components of CSRI. From its results, it is possible to concluded that for 6th typically developing writers, both, direct instruction and modelling components, are equally effective (Lopez et al., 2017); or that teaching explicitly planning and revision processes is not necessary and can, in fact, result in an increase of the time needed by the students to produce their texts, with no gain in the quality of the text (Fidalgo et al., 2015).

The strategy-focused instruction CSRI is the main focus of the empirical studies that constitute the present thesis (chapters 3, 4 and 5). The original CSRI program has been adapted for 4th grade students. The first empirical study (chapters 3 and 4) was focused on the analysis of different instructional components of CSRI, whereas the second empirical study (chapter 5) addressed the analysis of the instructional content focused on planning process. Furthermore, this doctoral thesis extends our existing understanding of the effects of the CSRI program to younger participants (4th grade students) compared to those who have typically been studied in previous intervention evaluations (6th grade students). Because of the learning of writing depends not only on instructional factors, but also the students' own cognitive factors (e.g., Harris et al., 2002) it is important to ask whether strategy-focused instruction CSRI is effective for 4th grade students in order to prevent future difficulties in higher grades.

Is strategic-focused instruction possible through technology?

As we mentioned in the previous section, the multicomponent nature of strategy-focused instruction can be challenging for the teachers if they have to implemented it

without external support from an expert and to adapt it to specific students' needs. Considering the normal duration of a literature class, all of this may demand too much time (prepare, apply, and evaluate the content) from teachers (Fidalgo et al., 2017). For these reasons, the development of an Intelligent Tutor System (ITS) called CSRI-OL (Cognitive Self-Regulation Instruction On-Line, see description Fidalgo et al., 2018) that incorporate explicit strategy-focused instruction could be a major step on the inclusion of this effective kind of instruction in schools (Roscoe & McNamara, 2013). At this respect, different meta-analysis (e.g., Goldberg et al., 2003; Graham et al., 2012) have shown how the use of technology is an effective practice to support, not only the teaching of written competence, but also the writing process of students with and without learning difficulties (e.g., Crinon & Legros, 2002; Englert, et al., 2005; MacArthur, 2009; Quinlan, 2004). From these studies, it is possible to conclude that technology has been divided into two categories based on the writing process that supports. Consequently, it is possible to find specific tools, as a word processor or spellcheckers that support the more mechanical aspects of writing (such as spelling, grammar, or vocabulary) and also different tools to stimulate planning strategies such as electronic maps. One way to integrate the instruction of the entire writing process (in combination with practice and textual evaluation) in the same software package, is through the ITSs (Allen, et al., 2017). ITSs, are one of the most sophisticated tools in the field of virtual environments (Lajoie & Azevedo, 2006). In fact, well-designed ITSs have shown significant gains in learning from very different domains such a reading comprehension (Wijekumar et al., 2013) or physics (Graesser et al., 2003). Thus, ITSs can be an effective tool for teachers as they provide guidance and learning materials, and they can accurately assess students, diagnose performance deficiencies and use this information to adapt the learning experience appropriately (Shute et al., , 2000; Vanlehn, 2011).

Based on the above, in chapters 6 and 7, the author reviews and discusses empirical results of different and novel technologies in the context of writing (chapter 6), putting particular emphasis to the effects of ITSs (chapter 7). The aim is to better understand the relationship between technology and writing instruction and also to show, the potential that the development of ITSs opens up to the scientific and educational field of writing instruction.

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CHAPTER 2: AIMS

Objectives

This doctoral thesis has been developed in two empirical studies (chapters 3, 4 and 5) and two reviews of the literature (chapters 6 and 7; see figure 1).

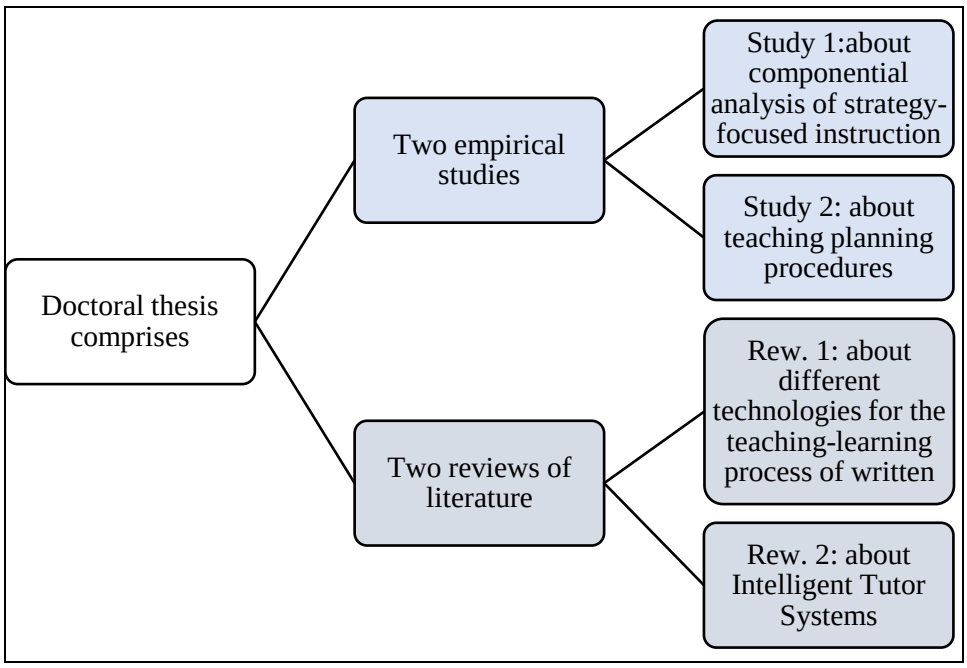


Figure 1. Structure of the doctoral thesis.

The studies have been carried out following three main objectives:

Objective 1: To analyze the effect of the different instructional components of the Cognitive Self-Regulation Instruction (CSRI) program focused on planning process for the improvement of the written competence of 4th grade students.

This aim is addressed in the first empirical study (chapter 3), entitled "Exploring the effects of strategy-focused instruction in writing skills of 4th grade students" (Rodríguez-Málaga, Cueli & Rodríguez, 2020). This work has been accepted in the journal *Metacognition and Learning* (indexed in Q1 in JCR; impact factor: 2.690. Information provided by the Web of Sciences- InCites Journal Citation Reports). The results of this study were extended in a second work (chapter 4) entitled "Is possible the transfer learning? exploring the effects of strategy-focused instruction in writing".

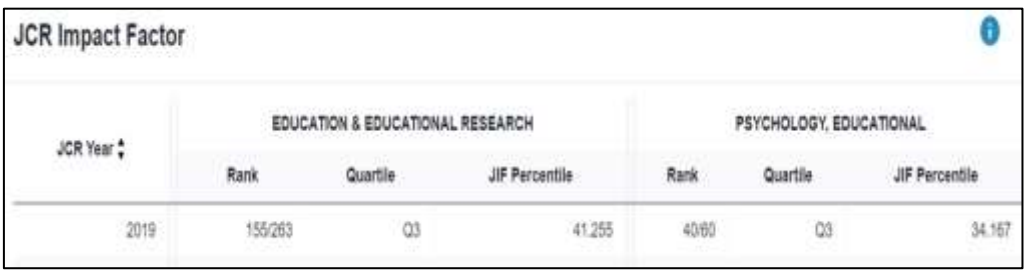

JCR Impact Factor

JCR Year	EDUCATION & EDUCATIONAL RESEARCH			PSYCHOLOGY, EDUCATIONAL		
	Rank	Quartile	JIF Percentile	Rank	Quartile	JIF Percentile
2019	37/263	Q1	86.122	13/60	Q1	79.167

As mentioned in the previous chapter, the efficacy of the original CSRI instructional program for the improvement of students' written competence has been corroborated mainly with students in the last year of primary school (Fidalgo et al., 2011; 2015; Lopez et al., 2017). However, it is necessary to corroborate the efficacy of CSRI in 4th grade students, who, according to previous studies (e.g., Limpo et al., 2014), do not deploy planning processes or have self-regulatory behavior during writing. Moreover, this study also represents a significant advance regarding the specific role that each of the instructional components (direct instruction, modelling or peer practice) has in improving the written in another age group (4th grade students) with a lower level of written competence than in previous studies (Fidalgo et al., 2015; Lopez et al., 2017). This can provide information about, not only the underlying mechanisms of strategy-focused instruction, but also information about what instructional components are the key and what components are superfluous for the teaching-learning of writing in real classrooms context.

Objective 2: To analyze the effect of the Cognitive Self-Regulation Instruction (CSRI) program focused on the textual product compared to another that additionally includes explicit instruction in the planning process for the improvement of the written competence of 4th grade students

This aim is addressed in the second empirical study (chapter 5), entitled "Exploring the short-term and maintained effects of strategic instruction on the writing of 4th grade students: should strategies be focused on the process?" (Rodríguez-Málaga, Rodríguez & Fidalgo, 2020). This work has been accepted in the journal *Reading and Writing* (indexed in Q3 in JCR; impact factor:1.445. Information provided by the Web of Sciences- InCites Journal Citation Reports).


JCR Impact Factor

JCR Year	EDUCATION & EDUCATIONAL RESEARCH			PSYCHOLOGY, EDUCATIONAL		
	Rank	Quartile	JIF Percentile	Rank	Quartile	JIF Percentile
2019	155/263	Q3	41.255	40/60	Q3	34.167

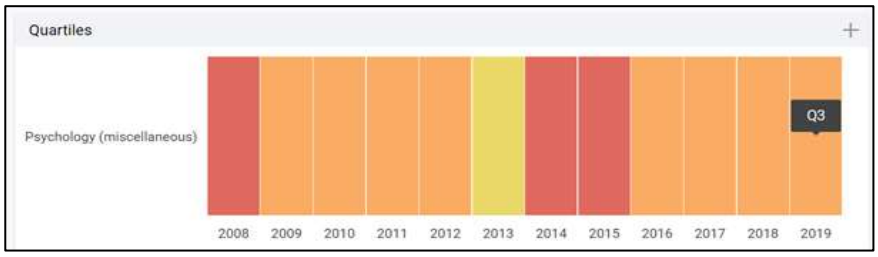
Previous studies of Fidalgo and co-workers (Torrance et al., 2015) explore a central component of strategy-focused instruction, that is, if teaching process strategies

(planning and revising) is necessary when the discourse knowledge is taught exhaustively. The results of this study demonstrated that teaching 6th grade students explicit planning and revision processes were not necessary and, in fact, result in students took longer to produce their texts, with no gain in the quality of the finished product. On the contrary, other studies show the importance of teach explicitly planning procedures (such as advance planning) because it can help young writers manipulate content before they start writing (e.g., Bouwer et al., 2018; Saddler et al., 2019; Shen & Troia, 2018).

The second empirical study of this doctoral thesis aims to replicate the study of Torrance et al. (2015) but in 4th grade students with a lower level of written competence. The contribution of the study, beyond its applied aspect, will represent a significant advance in understanding the underlying mechanisms that explain the efficacy of this type of instruction.

Objective 3: To analyze the published research on new technologies and writing instruction, in order to show the state of the art about what types of tools are available for the teaching-learning process of written competence and what their effects are.

The third aim is addressed in two reviews of literature (chapters 6 and 7). The chapter 6 presents a general overview about the effects of different technological tools that support the different processes involved in writing. This review entitled "Different technologies in the context of writing instruction" (Rodríguez-Málaga, Rodríguez & Fidalgo, 2019) was published in the editorial *Nova Science Publisher*. The chapter 7 presents a specific overview about the effects of Intelligent Tutor Systems (ITS). This review entitled "New learning environments for writing: intelligent tutoring systems" (Rodríguez-Málaga, Rodríguez & Fidalgo, 2019) was published in *Papeles del Psicólogo* (indexed in Q3 in Scopus, impact factor: 0.376. Information provided by Scientific Journal Rankings - SJR).



Research on writing instruction suggests that for students develop the skills needed to produce high-quality texts, they need to be provided with adequate instruction.

More specifically, they need a combination of strategy-focused instruction and practice (Graham & Harris, 2017). One significant problem is relating to the difficulty of implementing it in classrooms context. The time needed to prepare classroom materials or to read text of students, and provide personalized feedback, can be a challenge for teachers. To solve this problem, researchers and educators have increased their attention to design computer-based systems that can provide help to the teachers by providing students with automated writing instruction and practice (e.g., Allen, et al., 2015).

Both reviews of literature present the state of art around what types of technologies (chapter 6) and ITSs (chapter 7) are available for learning writing skills and what their effects are. The purpose is to set the theoretical framework that supports the future development of CSRI-OL (Cognitive Self-Regulation Instruction On-Line; Fidalgo et al., 2018) and empirical research.

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Torrance, M., Fidalgo, R., & Robledo, P. (2015). Do sixth-grade writers need process strategies? *British Journal of Educational Psychology*, *85*(1), 91-112. https://doi.org/10.1111/bjep.12065

CHAPTER 3: EXPLORING THE EFFECTS OF STRATEGY-FOCUSED INSTRUCTION IN WRITING SKILLS OF 4TH GRADE STUDENTS

This chapter faithfully reflects the content of: Rodríguez-Málaga, L., Cueli, M. & Rodríguez, C. (2020). Exploring the effects of strategy-focused instruction in writing skills of 4th grade students. *Metacognition and Learning* (in press). https://doi.org/10.1007/s11409-020-09247-3

Introduction

Writing skills constitute a basic and fundamental condition of participation both in society and academic environments (Graham 2018). Becoming an effective writer demands not only mastery of transcription skills (e.g., handwriting and spelling) but also the deployment, executive control, and self-regulation of high level cognitive processes such as planning, drafting, and modifying ideas according to their correct linguistic form as well as revising and editing (e.g., Hayes 2012; van den Bergh et al. 2016).

However, given its multidimensional nature, mastering writing is a significant problem for new writers who face a "double challenge" (Rijlaarsdam and Couzijn 2000). According to these authors, students must perform two tasks during the writing activity: writing and learning to write. As writers, the aim is to produce text with the three main characteristics of Structure, Coherence, and Quality. As learners, the students' objective is to learn to write and consequently acquire writing skills (transcription skills, planning, revision and so forth).

In this sense, if students do not have sufficiently automatic transcription skills, they devote most of their cognitive resources to text production (e.g., word choice, spelling, sentence construction) and fewer resources to higher-level cognitive processes (e.g., planning, evaluation, review; Limpo and Alves 2018; McCutchen 2011; Rijlaarsdam et al. 2011). As Olive and Kellogg (2002) showed in their study with 3rd graders, when handwriting is not yet automatic, the process of transcription demands working memory resources, leaving few resources available for other high-level cognitive processes. Even in older students (upper-primary and high school), some studies have shown that students spend little time planning or reviewing and the use of these high level of cognitive processes is inefficient resulting in poor quality text (Albertson and Billingsley 2000; Beauvais et al. 2011; Limpo et al. 2014; López et al. 2019). Therefore, although it is important for students in all grades to receive effective instruction in writing skills, providing it in the first few years of primary education would prevent future difficulties in higher grades (Arrimada et al. 2019). In this context, different approaches and strategies have been developed for improving students' written skills. The present study focuses on examining the benefits of a specific strategy aimed at improving written skills, reflected in the production of text with Structure, Coherence and Quality.

One of the most effective approaches for achieving management of writing skills is strategy-focused instruction; alone or combined with self-regulation procedures (see the

meta-analyses by Graham and Harris 2017; Graham et al. 2012). According to Zimmerman's Model (2000), self-regulation is a cyclical process involving three phases: a) a forethought phase allows students set goals, analyze the task and plan strategies to achieve it; b) a performance phase includes self-control (meta-cognitive knowledge and specific strategies) and self-observation (self-recording and metacognitive monitoring); c) a self-reflection phase (after performance) refers to the evaluation of the performance and includes self-evaluation and self-reactions (Zimmerman 2013).

The most widely and successfully used approach combining strategy-focused instruction and self-regulation is the Self-Regulated Strategy Development model (SRSD; Graham and Harris 2017). SRSD is a strategy-focused instruction approach aimed at teaching students about writing and the strategies involved in the writing process (e.g., skills for planning, monitoring and reviewing their own writing process) (Graham et al. 2015). The benefits of programs developed using the SRSD model have been well demonstrated in different educational stages and in students both with and without learning difficulties (e.g., Brunstein and Glaser 2011; Gillespie and Kiuhara 2017; Limpo and Alves 2013a; McKeown et al. 2019; Saddler et al. 2019). One of these programs is *Cognitive Self-Regulation Instruction* (CSRI) which was shown to be effective in improving the writing skills of 6th grade primary school students in regular classroom contexts (see review Fidalgo and Torrance 2017)

Cognitive Self-Regulation Instruction (CSRI)

CSRI was developed based on SRSD and Zimmerman's Model (see Harris and Graham 2017). The purpose of CSRI is to develop higher-levels of writing skills in upper-primary students (6th grade). With this aim, CSRI identified effective evidence-based practices including three instructional components: Direct Teaching, Modelling, and Peer-Practice (e.g., Graham and Perin 2007; Graham et al. 2012).

In Direct Teaching (before performance-task) the teacher focuses on teaching students metacognitive knowledge (different text types, characteristics of a quality text, and explicit knowledge about planning and drafting), self-regulation phases (planning, monitoring and review), and metacognitive strategies (related to planning and drafting through mnemonic rules). Meta-analyses (Graham and Harris 2017; Koster et al. 2015) provide evidence of the importance of teaching students metacognitive knowledge about the writing process and cognitive strategies. This knowledge will guide students through

the key steps that the teacher will carry out in the subsequent component and will encourage correct consideration during the first phase of the self-regulation model.

The Modelling component consists of giving the students a model to copy (the teacher) who exemplifies the correct steps of the writing processes, the typical mistakes students make, and how to correct them. Through the Modelling component, students identify, analyze, and evaluate the necessary steps that they will have to follow when writing their own texts. Research has shown that copying models (in contrast to mastery models) allow students to learn more and get better results (Braaksma et al. 2002; Zimmerman and Kitsantas 2002). The benefits of observational learning are well documented in the literature (e.g., Braaksma et al. 2010; van de Weijer et al. 2019). Through observation, students address all of their cognitive resources towards observing the model, who explains (how to write) and demonstrates the process (performs the writing task), stimulating the second phase of the self-regulation model, performance. To do this, the teacher uses thinking aloud protocols (a metacognitive technique that consists of the person doing the activity continuously verbalizing their thoughts while they do the activity; Montague et al. 2011). The inclusion of thinking aloud provides several advantages to both the teacher and the student. The teacher can evaluate what the students think and know and how they know it. Therefore, the teacher can give feedback about the writing process carried out by the student. For the student, the act of writing with thinking aloud can help them to achieve greater awareness and control over their own knowledge and skills. During composition, the students have to focus their attention on each step of the writing process displaying self-regulation skills such as self-control and self-monitoring (Bai 2018; Hartman 2001).

The Peer-Practice component involves the students emulating the process performed by the teacher (model). Several studies have shown the effectiveness of Peer-Practice on writing performance (e.g., Boon 2016; Grenner et al. 2018; Grünke et al. 2019; Wigglesworth and Storch 2012). In this component, students can practice their own writing (using the thinking aloud technique) in a supportive context where the instructor guides students, clarifying, monitoring, and reinforcing (Graham et al. 2013; MacArthur 2017). Through thinking aloud, students externalize the process, allowing their peers and the teacher to comment and provide scaffolding to guide the target behavior, while at the same time encouraging the third phase of the self-regulation model, self-reflection (Zimmerman 2013).

Despite the effectiveness of strategy-focused instruction in general (e.g., Bouwer et al. 2018; Koster et al. 2017) and SRSD in particular (e.g., Festas et al. 2015; Limpo and Alves 2013b; Palermo and Thomson 2018; Rosário et al. 2019; Saddler et al. 2019) there are two gaps in the literature about writing instruction. First, the different strategy-focused instruction programs have a multicomponent nature, which combine different instructional content (i.e., knowledge linked to the text product, metacognitive knowledge about the process with mnemonic rules) and instructional components (Direct Teaching, Modelling, Peer-Practice; Fidalgo, Torrance et al. 2017). This multicomponent nature prevents us from understanding which of these instructional components or what combination of them is key for achieving better results in writing instruction (De la Paz 2007; MacArthur 2017). Identifying the main components and the most effective combinations of components could make it easier to include strategy-focused instruction in the normal curriculum. Teachers rarely adopt this practice for reasons of time, the number of students in the class, or the challenge associated with the implementation of such an unusual component as Modelling without the support of researchers (Kistner et al. 2010).

In this regard (the importance of identifying which components and what combinations are essential), some studies have focused on exploring and comparing the efficacy of the instructional components of strategy-focused instruction. For example, Fidalgo et al. (2015) carried out a study with three 6th grade classes (N = 62) to assess the cumulative effects of a sequence of different instructional components of CSRI: (1) observation of a mastery model, (2) direct teaching, (3) peer feedback, and (4) only practice. Their results indicated that students who received the CSRI program improved the Structure, Coherence, and Quality of their written texts. This improvement was associated exclusively after the initial component, that is, the Modelling component (observation of a correct example of application of the strategies), without any type of Direct Teaching. The authors concluded that observation of a model followed by reflection promoted writing skills. However, Fidalgo et al. (2015) used a design in which the strategy-focused instruction always began with the Direct Teaching component.

A direct comparison of the benefits of Modelling and Direct Teaching was analyzed by López et al. (2017). Those authors randomly assigned 133 upper-primary students (10 to 12 years old) to one of two experimental conditions: Direct Teaching (students received explicit declarative knowledge of planning and drafting strategies), and Modelling (the

teacher provided procedural knowledge of how to implement planning and drafting strategies). Their findings suggested similar improvements in both experimental conditions in all measures (Structure, Coherence and Quality of texts).

On similar lines, De Smedt and Van Keer (2018) investigated the combined effectiveness of explicit instruction and writing with peer-assistance in a study involving 206 fifth and sixth-grade students. These students were randomly assigned to one of four experimental conditions: (a) explicit instruction + individual writing; (b) explicit instruction + writing with peer assistance; (c) matched individual-practice comparison condition; and (d) matched peer-assisted practice comparison condition. The authors found that the first group of students outperformed the matched individual-practice students at posttest, highlighting the importance of explicit instruction. Furthermore, De Smedt and Van Keer (2018) did not find differences when comparing the individual writing and peer-assisted conditions.

A limitation of the studies noted above was that they used students in the final years of primary education, despite the aforementioned importance of providing effective instruction to young children. Another significant gap in the literature is the previously noted absence of studies looking at the long-term effects of strategy-focused instruction. In this regard, Hacker et al. (2015) stated that few studies included maintenance measures, and most did not exceed eight weeks after the end of intervention. As de Boer et al. (2018) argued, metacognitive knowledge and strategies may need more time to carry out or demonstrate greater effectiveness in the long-term. Because the goal of teaching students strategies is to encourage effective autonomous learning over the long-term, (not just during an intervention), the study of maintenance strategies becomes a key focus for educators.

The present study addressed these limitations by examining the short- and long-term effects of different sequences of the instructional components of CSRI on the writing skills of 4th grade students (aged between 9 and 10 years old). In order to do this, we designed two experimental conditions that differed in the sequence of instruction components. In experimental condition 1, the students first received the Direct Teaching component, followed by Peer-Practice, followed by Modelling. In contrast, in experimental condition 2, students first received the Modelling component, followed by Peer-Practice, followed by Direct Teaching. Similarly to López et al. (2017), we took both Modelling and Direct Teaching as starting points because writing skills can be

improved by providing a framework of specific strategies (Direct Teaching) that guides attention to the key steps of the writing process performed by a model (Modelling) and the specific steps to follow (Peer-Practice). In this sense, prior research has already shown the positive effects of Direct Teaching about how to write and to plan and revise (e.g., Bouwer et al. 2018; Rietdijk et al. 2017). On the other hand, according to Fidalgo et al. (2015) it may be enough to provide students with the Modelling component to achieve writing performance. In this regard, successful interventions have included the Modelling component as an instructional mode to teaching writing strategies (Braaksma et al. 2010; Koster et al. 2017). Moreover, our design also explored whether the Peer-Practice component can have a key role in students' learning following the Direct Teaching component (De Smedt and Van Keer 2018), due to their complementary nature and the opportunity students have to learn from each other (Graham 2018), or whether the Peer-Practice component is unnecessary.

Present study

The aim of this study was to explore: a) the short-term and long-term effectiveness of strategy-focused instruction (6 sessions) on the writing skills of 4th grade students; and b) the component, or order of implementation, that has the greatest effect on writing skills based on the cumulative effects of the instructional components.

The effectiveness of the strategy-focused instruction was assessed in the short-term at 5 time points: at the beginning of the intervention (Pretest), after the end (Posttest), after each component (Test 1 and Test 2). There was also an assessment eight months after finishing the intervention (Follow-Up) to check which group maintained the effects (or if there was any effect) of strategy-focused instruction in the long-term.

Our hypothesis was that strategy-focused instruction (CSRI) would be beneficial to writing skills (reflected in greater Structure, Coherence and Quality of the text product) over and above that afforded by traditional instruction, in both the short-term (Pre/Posttest), and the long-term (eight months after finishing the training). The writing from the students in the control condition would be less coherent, less well structured, and of poorer quality than the writing from students in the experimental conditions. The study of the effect of these kinds of strategies on written skills will have an impact on classroom practice and on future teacher recommendations.

Method

Participants and design

The sample comprised a total of six classes in 4th grade primary education (N = 126) from three different mixed state- and privately-funded schools in the North of Spain. Students' ages ranged from 9 to 10 years old. Participants' details are shown in Table 1. The initial sample comprised 153 students. Sixteen students who had existing diagnoses of learning disabilities and special educational needs were not included in the statistical analysis although they did receive the same instruction as their peers. Furthermore, 11 students who did not attend all the evaluation time points were not considered in the statistical analysis [attrition rates of 0.72% were observed at Test 1 (n = 1); 2.20% at Test 2 (n = 3); 0.75% at Posttest (n = 1); and 4.54% at Follow-Up (n = 6)].

Prior to the intervention, all students followed the ordinary Spanish school education curriculum (focused mainly on teaching text production and rules for correct spelling and grammar).

Table 1 Descriptive characteristics of the participants for the three conditions.

	N = 126	n male (n female)	Mean age (SD)
Experimental condition 1	47	26 (21)	9.36 (0.48)
Experimental condition 2	36	16 (20)	9.56 (0.58)
Control condition	43	21 (22)	9.27 (0.46)

Note. SD = Standard Deviation.

The six classes were randomly assigned to one of the two experimental conditions or to a control condition, with a result of two classes in each condition. Both experimental conditions received the strategy-focused instruction (CSRI) but differed in the order in which instructional components were implemented: Direct Teaching, Practice and Modelling (experimental condition 1); Modelling, Practice and Direct Teaching (experimental condition 2). In the control condition students received examples of high-quality texts without any strategy-instruction.

The effect of the instruction was assessed by the change in the written skills across 5 time points: immediately prior to intervention (Pretest), following each component (Test 1 and Test 2), at the end of the intervention (Posttest), and eight months after

finishing the intervention (Follow-Up). The design of the evaluation is outlined in Table 2.

Table 2 Research design showing instructional sequences and writing assessment probe for each condition.

Condition	Week 1-2			Week 3-4		Week 5-6		8 months later
EC 1	PRE	Direct Teaching	Test1	Peer-Practice	Test2	Modelling	POST	Follow-Up
EC 2	PRE	Modelling	Test1	Peer-Practice	Test2	Direct Teaching	POST	Follow-Up
CC	PRE	Control	Test1	Control	Test2	Control	POST	Follow-Up

Note. EC1 = Experimental condition 1; EC2 = Experimental condition 2; CC = Control condition; PRE = Pretest; POST = Posttest.

Training: CSRI program

The strategy-focused instruction used was the CSRI program (developed under the SRSD model; Harris and Graham 2017). This program is aimed at developing student strategies for setting appropriate production goals and process strategies focusing on expository compare-contrast texts (see Fidalgo, Harris et al. 2017). Specifically, the CSRI attempts to develop students' strategies for planning and drafting appropriate compare-contrast texts. The program had three components (Direct Teaching, Modelling and Peer-Practice) with two sessions for each component (there were a total of six sessions, following a schedule of one session of 1 hour per week). The three components varied in terms of how the content was delivered. The content of the CSRI program and the content of the control condition were both controlled so that the students received the same amount of instruction in Structure, Coherence and textual Quality in 1 hour (the normal duration of the intervention session). It was emphasized that the teachers had to adhere to the step-by-step content scripted by the researchers, and that they could not repeat the content or divide the session into several parts (nor change the focus of the instruction according to their own criteria). In the same way, the students were not allowed to take

the work material to study or memorize at home. Moreover, we also checked that at the beginning of the sessions all the teachers reminded students of the content taught in the previous sessions. In this way, no student started the session at a different level and with different knowledge from the rest of the class.

The features of the three training conditions are described in Table 3 and are summarized below.

Table 3 Summary of features of the three training conditions

	Condition 1	Condition 2	Control
Instructional content			
Product goals (the oaiue mnemonic rule)	+	+	-
Planning and drafting writing strategies	+	+	-
Structural and linguistic features of compare–contrast essays	+	+	+
Instructional approach			
Direct Teaching of cognitive writing strategies through mnemonics	+	+	-
Modelling of the planning and drafting processes through thinking aloud (without explicit reference to the cognitive writing strategies)	-	+	-
Modelling of the planning and drafting processes through thinking aloud (with explicit reference to the cognitive writing strategies)	+	-	-
Analysis of high-quality compare-contrast texts	+	+	+
Practice in pairs	+	+	+
Motivation support	+	+	+

Kind of knowledge provided			
Self-Regulated approach	+	+	-
Declarative knowledge	+	+	+
Procedural knowledge	+	+	-

The first experimental condition included the three components in the sequence: Direct Teaching, Peer-Practice and Modelling. The Direct Teaching component contained two sessions in which students were introduced to the strategy planning process (Session 1) and then to the drafting process (Session 2). At the beginning of Session 1, the instructor taught a metacognitive matrix identifying the nature, purpose and central features of effective planning processes. Then students were introduced to the mnemonic POD + the vowels OAIUE, as a scaffold for planning their compare-contrast texts. POD stands for each of the steps: (1) *Think of ideas -Pensar-* before writing; (2) *Organize* your thoughts with the OAIUE mnemonic rule [O *(Objective)* prompted students to identify the purpose of different text types; A *(Audience)* prompted students to capture future readers' interest and attention, motivate them to read, and make it easier to understand; I *(Ideas)* prompted students to think of ideas, brainstorm or search for other documentary sources, and differentiate between main and secondary ideas and examples; U *(Union)* reminded students to connect the ideas in the text, joining thematic ideas (e.g., similarities vs. differences in comparison - contrast text); E *(Esquema-Plan)* reminded students to make a *plan* including ideas about the introduction, development and conclusion]; and (3) *Develop* the text (Figure 1).

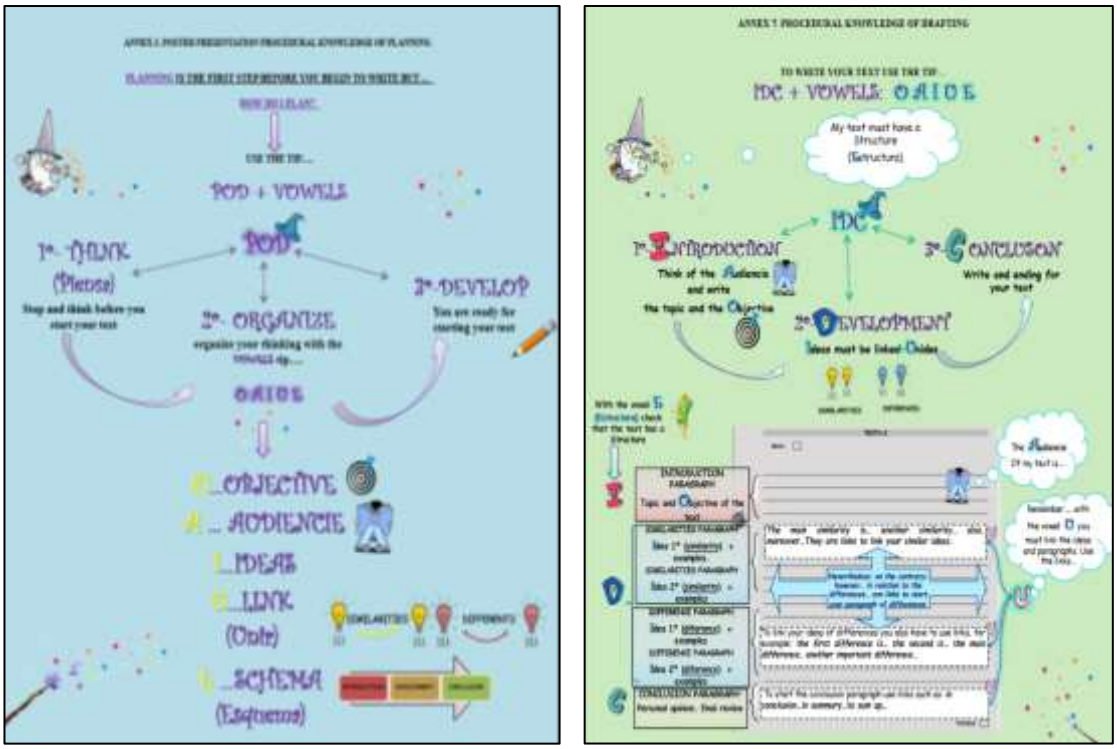


Fig. 1 Example of graphic organizer of POD + the vowels OAIUE and IDC + the vowels OAIUE.

In the second session of the Direct Teaching component, students were given a metacognitive matrix identifying the nature, purpose and central features of effective drafting processes. Then, the instructor taught the mnemonic IDC + the vowels OAIUE (see Figure 1). IDC encourages the organization and structure of a comparison-contrast text: (1) *Introduction* in which students should present the topic, the purpose of the text and capture the readers' interest; (2) *Development* in which students were instructed to develop the ideas and examples to explain these ideas and; (3) *Conclusion* which reminded students to make a personal contribution to the text, an overall point of view, or reflection of everything discussed in the text. Again, the vowels provide criteria about the content during all three of the IDC production phases. Both strategies were supported by illustrated summaries showing the POD and IDC+ vowels mnemonics to facilitate students' learning.

The Peer-Practice component required students to work in pairs planning (Session 3) and drafting (Session 4) a compare-contrast text. The first session (Session 3) started with the instructor reminding students of the content of previous sessions and giving students some practice in thinking aloud. The instructor selected students with similar abilities and paired them. Students were assigned to writer or helper roles. The more

extrovert student or the one more likely to thinking aloud was the writer and the other was the helper. These roles were maintained throughout the intervention. During composition, thinking aloud helped expose the writing processes adopted by the writer to the helper's observation and comments. The students' writing processes were scaffolded by graphical organizers. While the pairs were planning their texts, the students had in front of them a sheet with spaces for the student's own notes in the margins laid out following the Vowels criteria (so students would not forget to do it). In the second session of this component (Session 4), the writer took the outline created in the previous session and translated it into text. This session then followed an identical pattern to Session 3, with a focus on the IDC mnemonic. In both sessions, during thinking aloud composing, the instructor also patrolled the class, listening to the thinking aloud and providing feedback and help for the writer about how to perform the thinking aloud and apply the strategies taught.

Finally, in the Modelling component the teacher demonstrated the correct writing process steps for the planning strategy (Session 5) and drafting strategy (Session 6) previously explained in the Direct Teaching component. Modelling involved thinking aloud while composing a compare-contrast text in front of the class. Thinking aloud was mainly scripted. The teacher emphasized explicit references to the strategy with a self-regulatory approach to the task (*The first thing I am going to do is, as the letter E - Esquema- says, a Plan of my text …. But first of all, it is important that everything in my plan is done thinking of the letter A*), and with self-statements about positive expectations *(If I make a last effort I will do it, I have good ideas, I will continue like this!)* producing a written plan (Session 5) and draft text (Session 6). The teacher explained to the students that during the Modelling they had to concentrate on all the teacher's steps and thoughts during the writing process. After Modelling, students made notes about the model's most important thoughts. Then, the instructor facilitated a whole-class discussion, drawing together the students' observations. At the end, each student individually wrote down reflections about the differences between their own writing practice and the processes that they had seen.

The second experimental condition included the sequence of components: Modelling, Peer-Practice and Direct Teaching. First, the two sessions of the Modelling component followed the same pattern as the Modelling component in experimental condition 1, with the exception that the explicit reference to the strategy and mnemonic

rules associated was removed. In this case, the teacher did a Modelling following the steps of the planning process (session 1) and drafting process (Session 2) with thinking aloud in front of the class. The teacher emphasized explicit references to the process with a self-regulatory approach to the task (*The first thing that I am going to do is an outline of my text (…). But first of all, it is important that I do my whole outline thinking about who is going to read the text*), and self-statements about positive expectations to produce the written plan (Session 1) and draft text (Session 2). Again, after Modelling, students made notes about the model's most important thoughts to compare with their own writing practice and discussed it with the class-group. Second, the Peer-Practice component sessions had one difference compared to experimental condition 1. In this case, students were able to watch the teacher Modelling without explicit mention of the strategy or mnemonic rules. Students had to emulate the writing processes that they had seen modeled. During emulation, as in experimental condition 1, students worked in writer-observer pairs with thinking aloud planning their compare-contrast texts (Session 3) and translated the plan to a complete text (Session 4). During emulation, the teacher provided direct input for the writer (including prompts to thinking aloud if they forgot to do so) and to provide a model for the observer. Finally, in the Direct Teaching, as in experimental condition 1, the students were introduced to the concepts underlying the POD + OAIUE mnemonic rule (Session 5) and the IDC + OAIUE mnemonic rules (Session 6).

The control condition was production-focused without any strategy instruction (i.e., without teaching explicit strategies for setting product goals) but with the same level of practice as the experimental conditions. This involved instruction relating to the structural and linguistic features of the compare-contrast text. The instructional program is described briefly below.

In the first sessions (1 to 3) the instructor focused on teaching different types of texts and their characteristics. The instructor started the first session with a brainstorm on the importance and value of a good writing. After that, the instructor taught the objectives of three text types (narrative, descriptive and compare-contrast text). Then, the instructor presented the students with two tasks in which they had to identify textual examples for each of the previously taught text types. In Sessions 2 and 3 the instructor presented the structure and production of each of the three types in detail. To make it easier for students

to memorize content, the teacher gave the students different text types to identify and analyze the characteristics of.

In the last few Sessions (4 to 6) the instructor focused only on the compare-contrast type text. In the Sessions 4 and 5 students wrote a compare-contrast text in pairs (one text in each session) aiming to emulate the type-specific features of the example explained in the previous sessions. The instructor put students with similar abilities into pairs for the collaborative writing task. Students were assigned to writer or helper roles. The more extrovert student or the one more likely to thinking aloud was the writer and the other was the helper. Once they had written the text, each of the pairs read their texts aloud so that the instructor and the class group could provide feedback on whether the text had the required characteristics of a compare-contrast text. In Session 6 the instructor gave students an incomplete compare-contrast text. The students were divided into groups and completed the missing parts of the text without the help of the instructor. After the task was finished, the instructor guided a group discussion about whether the text was completed properly.

Instruments and measures

***Writing Assessment Task*.** In the writing assessment task, students had to write a compare-contrast text based on the similarities and differences between various topics that were selected beforehand based on students' interests: Pretest (computer games versus traditional games) , Test 1 (summer holidays versus winter holidays), Test 2 (book versus film), Posttest (travel by car versus travel by plane), Follow-Up (superhero versus ordinary human).

***Evaluation session*.** The evaluation session lasted 1 hour in which the researcher (educational psychologist who was a member of the research group) gave the students small cards which included the title of the topic (for example traditional games versus computer games) with a picture about the topic (e.g., computer and football). Then students were asked to write a compare-contrast text. The specialist researcher provided students with two work sheets, one for planning and one for the final text. Students were told that using the first work sheet was optional. The specialist researcher reminded the students that they had 1 hour to write their text and encouraged them to produce the best essay that they could. The specialist researcher did not provide any help during the evaluation writing task. Students were evaluated at 5 time points: at the beginning of the intervention (Pretest), after the end (Posttest), after each component (Test 1 and Test 2),

and eight months after finishing the intervention (Follow-Up). Thus, each student wrote five texts. A total of 603 texts were collected and assessed.

Product assessment. Texts were analyzed using the anchor text procedure from Rietdijk et al. (2017). In this procedure, texts were rated in separate rounds for each dimension or measure (Structure, Coherence and Quality,) for which a specific criteria and definition was provided to the evaluators (independent researchers of writing instruction and assessment). First, they chose a sample of 50 texts from the total. From these 50 texts, five anchor texts were identified representing scores at the mean and 1 and 2 standard deviations above and below the average: two weaker texts (scores 70-85), an average text which was assigned the arbitrary score of 100, and two better anchor texts (scores 115-130) [see Appendix 1. Example of anchor texts (scores 70 weaker text, 100 average, and 130 better text) and transcribed student texts]. Then two evaluators independently rated all of the texts in 3 separate rounds, one round per variable (Structure, Coherence and Quality) with the five anchor texts providing benchmarks. The mean score was arbitrarily set at 100, and the remaining anchor texts at 70, 85, 115, and 130. This procedure was repeated for each evaluation time point (Pretest, Test 1, Test 2, Posttest and Follow-Up). For the development of the benchmark rating scale the evaluators took examples from other studies (Bouwer et al. 2018) in tandem with their prior knowledge of other types of evaluation procedures involving information about concepts and assessing aspects related to the Structure, Coherence and Quality of the texts.

The mean inter-rater consistency (Pearson's *r*) of each variable across time point (Pretest, Test1, Test 2, Posttest and Follow-Up) was greater than .90. In addition, the intraclass correlation coefficient (ICC) estimates and their 95% confidence intervals were calculated based on a mean-rating (k = 6), consistency, 2-way mixed-effects model. The ICC demonstrated moderate reliability for Structure (ICC = .576), Coherence (ICC = .687), and Quality (ICC = .659). Under these conditions, ICC values less than 0.5 are indicative of poor reliability, values between 0.5 and 0.75 indicate moderate reliability, values between 0.75 and 0.9 indicate good reliability, and values greater than 0.9 indicate excellent reliability (Koo and Li 2016).

Procedure

Training delivery.

The study was conducted during the spring school term. The sessions took place in literacy lessons. The full implementation of the program was carried out by six teachers (educational professionals with master's degrees in primary education), one for each class. The training of the teachers was a fundamental element through which we ensured the program was carried out accurately by establishing what the teachers had to do and how they had to do it. Previous research has indicated that training teachers in writing practices has not only a positive relationship with the quality of student texts (De Smedt et al. 2016) but also more positive feelings about writing instruction (Koster et al. 2017).

Teacher training.

Prior to the start of the intervention, a specialist researcher who guided the study methodology presented the CSRI program to the teachers covering general information, background, and implementation schedule. Then, in order to facilitate the implementation of the CSRI program, all the teachers were given the complete set of materials for each student (individual portfolios) and a "teacher session manual" containing detailed descriptions of the 6 sessions. The manual contained: (a) Instructions for how to start, carry out, and finish the session (*e.g., This session starts with a Modelling of the planning process. An example Modelling will be shown to the class group about what steps students should take before starting to write a compare-contrast text*); (b) The specific materials to be used for each step of the session and how to address the students (*e.g., You should read the appendix about the Modelling technique with thinking aloud. An example video is provided to give you a better understanding of the Modelling technique*. *Use the appendix about implementing Modelling to facilitate*); (c) Instructions about how to talk to the students and activities for them (*e.g., Explain to the students that during the Modelling they have to be very attentive, they have to stay quiet and focus on all the steps and thoughts that you perform during planning the text; give the students the appendix which has an example of planning*).

The researcher asked teachers to read the session information carefully before the start of training to discuss and clarify any questions during the training sessions. There were a total of three training sessions (one training session for the Direct Teaching component, another to support Modelling and a final session to support the Peer-Practice component). Each training session took place a week before it was implemented. Teachers were trained individually by the specialist researcher and all sessions lasted for approximately 60-80 minutes following the same two-part pattern. In the first part of the

session, the researcher started with an explanation of the specific component (*what is Direct Teaching?)* and its goal [*e.g., the aim of session 1 is for students to develop declarative knowledge (what is textual planning), procedural knowledge (how a text is planned, through a specific strategy), and conditional knowledge (when and why a text is planned*)]. In the second part of the session the researcher explained and discussed the steps described in the teacher's portfolio. Specifically, in the Modelling training session in addition to reviewing the portfolio, the researcher showed an example video of how the Modelling component should be implemented. In addition, an example of thinking aloud was provided for use in the instructional session (see Appendix 2) and was trained during the session. In this second part of the session, teachers were able to ask questions and resolve any issues they may have had about implementing the sessions. The researcher also met with teachers on a weekly basis during the intervention period to go over the details of that week's program and share their experience of the intervention sessions.

Treatment fidelity.

We used the following measures to ensure that the teachers implemented the program appropriately: First, all teachers were given manuals including the elements and activities for each session. Second, a specialist researcher met with the teachers weekly to train them in applying the instructional procedures and to interview them about their experiences of the intervention sessions. Third, the student portfolios with the set of materials were reviewed following the sessions, allowing us to check whether the students had correctly completed the tasks, such as in the Modelling sessions, where students had to watch the teachers' thinking and actions and write them down. Data from the students' portfolios reported to have completed 92.4% of the tasks (*SD* = 0.40, range 80–90). Moreover, intervention sessions from three of the total of six teachers were recorded in audio. The first author listened to the intervention session recordings and noted whether each step or procedure was completed. The fidelity for these teachers averaged 89.0% (*SD* = 0.94, range 80–100), 90.3% (*SD* = 1.16, range 80–100) 97.0% (*SD* = 0.24, range 80–100). For the rest of the teachers (that did not consent to be recorded), we observed the implementation of three sessions (the first sessions of each component). Fidelity was evaluated with checklists that identified specific steps of the session observed. Steps were coded as 1 as completed, and 0 not completed. If teacher completed the step the performance was coded with a 10-point scale (a rating of 1 represented poor

implementation and a score 10 high-quality implementation). Data from the observations indicated that teachers completed 92.9% of the steps (*SD* = 0.40, range 80–100). If teacher did not meet the study's strict fidelity requirements the data was excluded. To ensure a procedure that respects ethical standards, we sent a letter to the families in which they were informed of the objectives and nature of the study. We requested written informed consent from the families for their children's participation in the study. After the intervention, the strategy-focused instruction CSRI was delivered to each of the teachers in the control group. This procedure ensured that all participants had the opportunity to benefit from the strategic intervention.

Data analysis

The data was analyzed using SPSS 24.0. The normal distribution of the three measures (Structure, Coherence and Quality) allowed us to conduct a parametric analysis. First, in preliminary analysis, the normal distribution and differences regarding Condition, Sex and Teacher-Class were analyzed. The variable Teacher-Class was taken as a covariate. Considering the aims of the study, to determine the benefits of the CSRI program on every measure, different General Linear Models (GLMs) were conducted. Specifically, a one-way analysis of covariance (ANCOVA) was carried out for Structure, Coherence and Quality in each evaluation time point. The independent variable was the Condition (control condition, experimental condition 1 and experimental condition 2) and the dependent variables were the student performance in each measure (Structure, Coherence and Quality) at Pretest, Test1, Test2, Posttest and Follow-Up.

In order to assess the learning gain from the CSRI program more deeply, we analyzed the interaction between the condition by time point. We used one GLM (repeated measures ANCOVA model) for each measure at the time points Pretest-Posttest, Pretest-Test 1, Test 1-Test 2, Test 2-Posttest, and Posttest-Follow-Up. The independent variables were the evaluation time point and the condition, while the dependent variables were student performance in each measure (Structure, Coherence and Quality).

We used Bonferroni's multiple comparison test to determine the groups between which significant differences were found (*post hoc* Bonferroni comparison test, $p < .05/3 = .016$). Effect sizes were assessed using partial eta squared: $\eta_p^2 < 0.01$ = small effect, $\eta_p^2 \geq 0.59$ average effect; and $\eta_p^2 \geq 1.38$ = large effect (Cohen 1988).

Results

Preliminary compare-contrast text results

The asymmetry and kurtosis values of the variables were within the intervals that denote a normal distribution (Kline 2011). Table 4 summarizes the means and standard deviations for each variable by Condition and evaluation time.

Differences in Pretest variables were analyzed with regard to: Condition, sex and Teacher-Class (given that the teachers varied across conditions). We carried out different Univariate Analysis of Variance (ANOVAs) taking the measure (Structure, Coherence, or Quality) as dependent variable and the condition, sex or Teacher-Class as independent variables. The results indicated that the differences were not significant for the condition groups in relation to Structure, $F(2, 123) = 1.076$, $p = .34$, $\eta_p^2 = 0.01$, Coherence, $F(2, 123) = 0.384$, $p = .68$, $\eta_p^2 = 0.00$, nor Quality, $F(2, 123) = 1.277$, $p = .14$, $\eta_p^2 = 0.02$; nor by sex in Structure, $F(1, 124) = 3.091$, $p = .08$, $\eta_p^2 = 0.02$, Coherence, $F(1, 124) = 1.396$, $p = .24$, $\eta_p^2 = 0.01$, and Quality, $F(1, 124) = 2.142$, $p = .28$, $\eta_p^2 = 0.01$. However, at Pretest level we found differences regarding Teacher-Class in Structure, $F(5, 120) = 2.349$, $p = .04$, $\eta_p^2 = 0.089$; Coherence, $F(5, 120) = 4.274$, $p = .001$, $\eta_p^2 = 0.15$; and Quality, $F(5, 120) = 8.838$, $p < .001$, $\eta_p^2 = 0.26$. We included the Teacher-Class variable as covariate in all the analyses following.

Table 4 Means, standard deviations, and results of the GLM (ANCOVAs) for Structure, Coherence and Quality variables by condition.

	EC1	EC2	CC	$F(2, 122)$	η_p^2
	M(SD)	*M(SD)*	*M(SD)*		
Structure					
Pretest	80.80(6.75)	80.88(7.42)	78.93(6.73)	1.03	0.01
Test 1	89.97(11.92)	85.41(11.52)	86.11(10.58)	7.82***	0.11
Test 2	112.23(16.10)	116.00(13.93)	94.06(18.11)	21.59***	0.26
Posttest	116.08(14.29)	121.36(11.33)	98.11(17.29)	26.59***	0.30
Follow up	98.14(14.21)	98.25(15.06)	91.79(14.55)	8.31	0.12
Coherence					
Pretest	85.17(9.92)	83.44(10.44)	83.58(10.42)	1.84	0.02
Test 1	89.76(10.66)	89.27(8.63)	90.02 (10.42)	5.92**	0.08
Test 2	106.63(13.52)	112.16(16.76)	93.72(14.88)	14.35***	0.19
Posttest	109.00(12.91)	114.08(12.53)	93.09(15.66)	23.30***	0.27
Follow up	96.53(12.84)	100.33(12.44)	93.00(13.82)	2.97	0.04
Quality					
Pretest	82.53(7.85)	83.00(7.59)	80.53(6.82)	3.60*	0.05
Test 1	91.72(11.35)	88.52(11.68)	87.88(11.91)	8.42***	0.12
Test 2	109.00(13.95)	114.38(13.61)	98.79(16.40)	9.611***	0.13

Posttest	112.93(13.05)	116.97(11.67)	96.16(16.74)	24.07***	0.28
Follow up	97.17(12.86)	99.77(13.12)	93.00(13.82)	3.268*	0.05

Note. EC1 = Experimental condition 1; EC2 = Experimental condition 2; CC = Control condition; *M* = Mean; *SD* = Standard Deviation; η_p^2 (eta-squared statistic) = estimates of effect size.

* $p < .05$; ** $p < .01$; *** $p < .001$

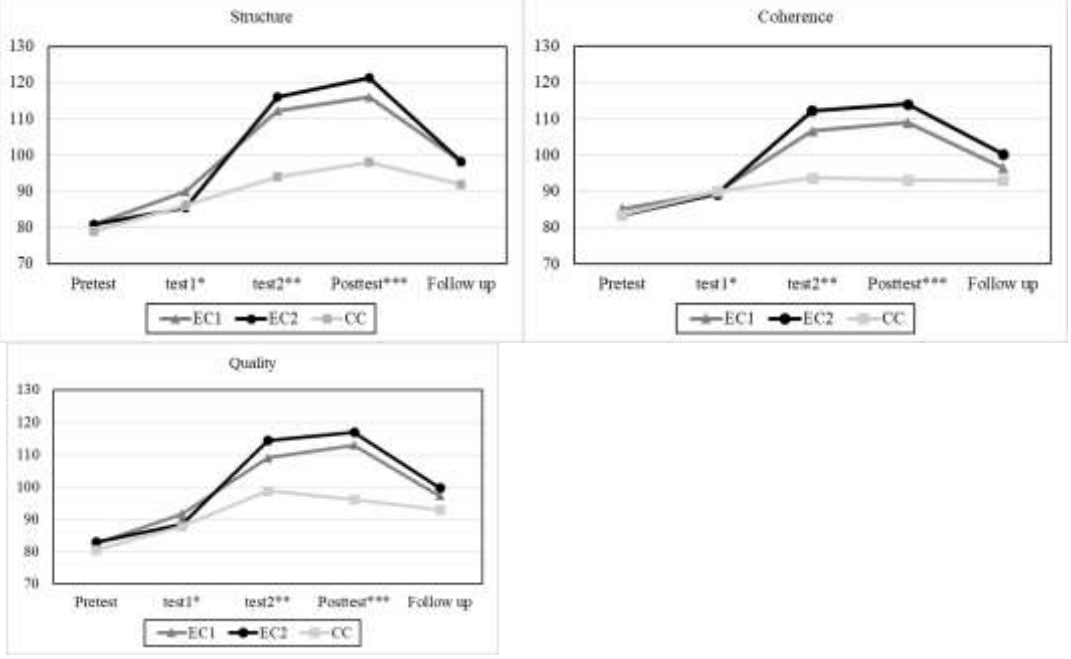
Condition Effects

Table 4 shows the differences between the three conditions for each time point and in each variable (Structure, Coherence and Quality). The GLM consisted of ANCOVAs taking the measures in Structure, Coherence and Quality as dependent variables, and the Condition as independent variable. With respect to the variables Structure and Coherence, the results reflected differences between the three conditions were statistically significant at 3 time points, Test 1, Test 2 and Posttest, with small effect sizes (which were higher at Posttest than at Test 1 or Test 2). At Test 1, *post hoc* analysis did not show differences between the three conditions. However, in the case of Test 2 and Posttest, *post hoc* analyses indicated statistically significant differences between each of the experimental conditions compared to the control condition for the three variables (experimental condition 1 vs. control condition $p < .001$; experimental condition 2 vs. control condition $p < .001$). In short, after four sessions of the CSRI program (Test 2) the three experimental conditions showed differences in the Coherence and Structure of their texts, reflecting better achievement from the two groups who received the intervention with no differences between them (experimental condition 1 and experimental condition 2). Effect sizes showed that differences were greater at Posttest (after six sessions of the CSRI program) followed by Test 2 (after four sessions of the CSRI program).

In terms of the variable Quality, the results of the ANCOVA showed statistically significant differences between the three conditions at each time point (see Table 4) with small effect sizes. Specifically, at Posttest the condition explained 28% of the variance; at Test 2, 13%; and at Test 1, 12%. *Post hoc* analyses showed that differences between the three conditions were not statistically significant at Pretest, Test 1 or Follow-Up. In the case of Test 2, *post hoc* analyses were statistically significant for the comparison experimental condition 1 and control condition ($p = .004$) and for the comparison experimental condition 2 and control condition ($p < .001$). Also, at Posttest, the *post hoc* analyses were significant for the comparison of each experimental condition with respect to the control condition (experimental condition 1 vs. control condition $p < .001$;

experimental condition 2 vs. control condition $p < .001$). The effect of the covariate (Teacher-Class) was statistically significant in all the comparisons examined with the exception of Pretest for the variable Structure ($p = .490$).

Finally, Figure 2 shows the change in performance over time in Structure, Coherence and Quality by condition.



*After two sessions. **After four sessions. ***After six sessions (full program).
EC1 = Experimental condition 1; EC2 = Experimental condition 2; CC = Control condition.

Fig. 2 Change in performance in each variable by condition.

Condition effects by testing time

GLM (repeated measures ANCOVA) for the variable Structure (Table 5), demonstrated that the main effect was significant for the comparisons between the time points Pretest-Posttest, Pretest-Test 1,Test 1-Test 2 and Posttest-Follow-Up (with small effect sizes). Considering the *post hoc* analysis, the differences between the two experimental conditions were nonsignificant. However, both experimental conditions exhibited significant differences compared to the control condition (with the exception of the time points Pretest-Test 1).

For the variable Coherence (Table 5), the main effect was significant for the comparison between three time points (Pretest-Posttest, Test 1-Test 2 and Posttest-

Follow-Up) with small effect sizes. In the three cases, *post hoc* analysis revealed differences between each of the experimental conditions and the control condition.

Finally, for the variable Quality (Table 5), the main effect was significant for the five comparisons (Pretest-Posttest, Pretest-Test 1, Test 1-Test 2, Test 2-Posttest, Posttest-Follow-Up) with small effect sizes. The *post hoc* analysis indicated that both experimental conditions produced significantly better results in Quality than the control condition (with the exception of the comparison between Pretest-Test 1).

The effect of the covariate (Teacher-Class) was statistically significant in all the comparisons with *p* values lower than .01 (Table 5).

Table 5 Results of GLMs (repeated measures ANCOVA) conducted for the three variables

	Interaction (evaluation time x condition)			Covariate (Teacher-Class)
	$F(2, 122)$	η_p^2	*Post hoc*	$F(1, 122)$
Structure				
Pretest-Posttest	19.84***	0.24	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	10.44**
Pretest-Test 1	6.15**	0.09	EC1 > CC: $p = .20$; EC2 > CC: $p = .96$	12.53**
Test 1-Test 2	20.22***	0.24	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	23.66***
Test 2-Posttest	0.43	0.00	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	17.80***
Posttest-Follow-Up	14.25***	0.18	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	36.75***
Coherence				
Pretest-Posttest	19.75***	0.24	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	10.24**
Pretest-Test 1	1.01	0.01	EC1 > CC: $p = .97$; EC2 > CC: $p = .98$	23.67***
Test 1-Test 2	23.80***	0.28	EC1 > CC: $p = .027$; EC2 > CC: $p = .002$	28.46***
Test 2-Posttest	0.99	0.01	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	14.00***
Posttest-Follow-Up	12.56***	0.17	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	23.09***
Quality				
Pretest-Posttest	18.51***	0.23	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	20.97***
Pretest-Test 1	3.42*	0.05	EC1 > CC: $p = .30$; EC2 > CC: $p = .98$	37.20***
Test 1-Test 2	12.58***	0.17	EC1 > CC: $p = .01$; EC2 > CC: $p = .008$	25.29***
Test 2-Posttest	4.36*	0.06	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	14.39***
Posttest-Follow-Up	13.43***	0.18	EC1 > CC: $p < .001$; EC2 > CC: $p < .001$	22.28***

Note. η_p^2 (eta-squared statistic) = estimates of effect size. From *post hoc* comparison of all students in each group the Bonferroni correction was applied ($p < .05/3 = .016$). EC1 = Experimental condition 1; EC2 = Experimental condition 2; CC = Control condition
* $p < .05$; ** $p < .01$; *** $p < .001$

Discussion

The aim of this study was to explore the short- and long-term effects of different sequences of strategy-focused instruction (CSRI) on the writing skills of 4th grade students. Our findings provide empirical support for strategy-focused instruction, as we initially hypothesized, and in accordance with previous findings (e.g., Brunstein and Glaser 2011; Palermo and Thomson 2018; Rosário et al. 2019; Saddler et al. 2019).

Strategy-focused instruction provides a complex package of content and instructional methods that gives students strategic knowledge that they can use to regulate what and how they write (MacArthur 2017). In this study we compared the benefits of two experimental conditions based on strategy-focused instruction which differed in the order of implementation of the components, to assess which sequence produced better improvement in writing skills (Structure, Coherence and Quality). The results suggested that after six sessions of training both sequences of the CSRI program were effective for the improvement of writing skills in 4th grade students. Both experimental conditions exhibited improvements in the quality of their writing compared to the control, which received traditional instruction based on text analysis. As we predicted, and in line with previous studies analyzing strategy-focused instruction (e.g., Bouwer et al. 2018; Cer 2019; Koster et al. 2017; Shen and Troia 2018), students in the experimental conditions produced texts that were assessed as being more coherent, better structured, and of higher quality.

Additionally, we focused on the individual effects of each component (Direct Teaching, Modelling, or Peer-Practice) to determine which of these components were necessary for substantial positive learning in writing (De la Paz 2007; Fidalgo, Harris et al. 2017) when taught to full-range classes. Specifically, we assessed students during the treatment (after each instructional component) to explore changes in writing variables, which allowed us to analyze which components were more effective. Results suggested significant benefits of CSRI after four intervention sessions. Before a firm conclusion can be drawn about the benefits of the CSRI the results need to be explained in more detail. Contrary to Fidalgo et al. (2015) and López et al. (2017) who found immediate benefits

of Modelling or Direct Teaching components, after two sessions, in our study we did not find significant effects between CSRI program students and the control condition in the three variables (Structure, Coherence and Quality). There may be several reasons for this lack of differences between the three conditions. One possible explanation is the combination of the nature of the sample, given that they were younger than those in previous studies of CSRI and the novel instructional content (typical writing instruction in Spanish primary schools is the analysis of features of different text types, sentence construction and spelling without any strategic-focused instruction). In experimental condition 1, students had to remember the metacognitive knowledge of the explicit strategy, remembering a mnemonic that represented the planning or drafting steps during the writing process. This could be an excessive cognitive load for developing students who have not yet automated sentence production (Rijlaarsdam et al. 2011). On the contrary, experimental condition 2, with students learning through observation, avoided the need for students to maintain explicit strategic representations and could reduce the dual challenge of learning-to-write and task execution (Kellogg 2018; Rijlaarsdam and Couzijn 2000). However, the content delivery method was novel (Modelling) and could have diverted their attention to the ideas the model gave about the topic *("the similarity between cars and airplanes is that both are transport")* not on the process *("the first thing I have to do is plan my text about similarities and differences between cars and airplanes").* The ability to differentiate a thought- process from an idea *per se*, is a complex task for young students if they have no previous experience and their metacognitive skills are in development. As Pennequin et al. (2010) states, metacognitive knowledge begins to develop at age of 6, however, this skill does not seem to reach maturity until early adolescence, at 11-12 years old. Another possible explanation is that in both experimental conditions instructional content was taught in a single, short session each week. It has been well demonstrated that implementing strategy instruction can be a challenge for teachers, especially Modelling, which many teachers are not familiar with (Harris and Graham 2017).

After two more sessions, adding the Peer-Practice component, we found that this component provided the greatest learning gains. Both experimental conditions showed significant gains in all variables compared to the control. This is consistent with previous research that emphasized the need for students to practice their writing in a supportive environment that includes peer-assisted writing (e.g., De Smedt et al. 2020; Graham et al.

2012; Koster et al. 2017; Yarrow and Topping 2001). Again, we found no differences between the two experimental conditions. During the Peer-Practice sessions, students rehearsed a strategy mnemonic (experimental condition 1) or specific process (experimental condition 2) with pair work clearly established (writer-helper). However, the way in which the students participated and gave feedback to each other could have influenced the quality of their learning (Graham et al. 2015; Wigglesworth and Storch 2012). During the collaborative writing in experimental condition 1, students had to remember the mnemonic rules about the planning and drafting steps. However, students had not had the opportunity to watch a model showing them how to implement the steps. In contrast, in the collaborative writing in experimental condition 2, the students had to remember the Modelling the teacher had done in the previous sessions [*"the model first thought of making an outline with three parts: Introduction, development and conclusion*"]. This probably explains why this condition had the highest average score. In both cases, the complexity of the strategies and processes practiced in a short period of time may be the reason that the two experimental conditions had a similar performance.

Finally, by adding the last two training sessions, both experimental conditions produced slight increases in writing performance with no differences between them. The small effect size demonstrated that the last two sessions reflected a maintained gain in performance but did not provide additional benefits over and above the Peer-Practice component. In experimental condition 1, students watched the model, which helped them to understand that using the strategies worked and was beneficial in the context of a real writing task. On the contrary, but equally effectively, in experimental condition 2, the teacher explicitly gave declarative knowledge about planning and drafting, and the mnemonics associated with helping students remember the planning and drafting steps.

One of the gaps in the literature that we aimed to fill was the absence of studies examining the long-term effects of strategy-focused instruction (e.g., Shen and Troia 2018; Torrance, 2015; Tracy et al. 2009). Our results showed that eight months after finishing the intervention both experimental conditions exhibited a significant decrease in all variables, reflected in the means for Structure, Coherence and Quality. At the Follow-Up evaluation, although we did not find significant differences between the three conditions, the two experimental conditions produced texts with more structure, coherence, and quality than the control group, above their Pretest scores. These results are somewhat similar to Hacker et al. (2015) and Brunstein and Glasser (2011) who

carried out an intervention based on SRSD with elementary grade students. In both cases their results showed that SRSD students wrote better compositions compared to the control at a Follow-Up test. However, Follow-Up probes were administered in the first study two months after the intervention and, in the second study after only six weeks.

Finally, we would like to comment that following the suggestions of Bouwer et al. (2015) about the validity of inferences made based on writing performance, in our study we used multiple test and different panels of raters in order to obtain valid genre-specific writing conclusions. Moreover, in relation to the significant effects of the covariate (teacher-class), this result reflecting the importance of the role of the teacher in classroom interventions and the need to control this variable more than covariate (Murnane and Willett 2011). The aim is to ensure that the changes in students' performance were due to the CSRI program and not to the particular teachers' practices. Future studies might consider running multilevel analyses.

In summary, the present study suggests that for 4th grade students, a short strategy-focused instruction is effective in improving writing skills in a short-term period. In particular, the Peer-Practice component may be a useful practice for promoting improvements in writing performance.

Limitations and future directions

The implications of our results should be considered in light of the following limitations. This research was performed in a specific school context and population. Therefore, to confirm these findings, the present study needs replication using a larger sample and more homogeneous groups in a different school context with different students (for example, other socioeconomic levels or students with learning difficulties). Another limitation was related to the lack of a specific assessment of writing strategies, metacognitive strategies, and self-regulated learning. This limitation could be overcome through analyzing student text per se (re-writing, errors or symbols and abbreviations that represent the strategy used by each student). Further limitation was related to the lack of a specific assessment of social validity (i.e., the acceptability of and satisfaction with the intervention procedures; Koster et al. 2017). This limitation could be overcome through interviews or questionnaires (e.g., Kiuhara et al. 2012) at different points of intervention.

In addition, we also want to draw attention to the limitations related to the use of the anchor text procedure. Recently, the value of the anchor text procedure has been

noted, given that it allows raters to evaluate text more reliably (they can compare student compositions with fixed example texts as benchmarks that represent the range in text variables) (De Smedt et al. 2020). However, the text scores represent only an approximation to the fixed text (Tillema et al. 2013). Nevertheless, since we chose a large number of anchor texts, the error due to interpolation was reduced to a minimum.

Finally, we suggest that it may be fruitful to study the linking of thinking aloud records with time spent on the text or changes produced on the text. Also, with the use of strategies as revealed in the traces of the written text (López et al. 2019). Moreover, a key aspect of Peer-Practice is to explore the feedback between students during writing. The form of feedback between students could have been an impact on learning (is not the same provide direct positive comment that suggests how to correct an error or, in contrast, provide indirect feedback as a general comment). As a literature suggests direct and constructive feedback is a crucial factor that significantly improves written performance (Duijnhouwer et al. 2012; Graham et al. 2015). The recording and analysis of Peer-Practice during writing may provide interesting information about students' interactions. At the same time, it may be fruitful to study whether the process transfers to another text type that is not the focus of instruction, or compare the effects of this instruction to other types of writing programs that place greater emphasis on giving students only strategies for setting appropriate production goals (Torrance et al. 2015).

Educational implications

In terms of educational implications, this study underlines not only the importance of promoting a supportive writing environment in which students practice, test and apply the knowledge learned, but also the message that writing is not a complementary task that is learned automatically. Writing needs to be taught and shown effectively to students for them to learn. CSRI has been shown to be an option as a tool for promoting writing skills in 4th grade students. The CSRI program was developed considering students in private and public schools (with and without learning difficulties, from different socioeconomic contexts) and considering the normal duration of classes in public and private schools. In this way, the CSRI program can be included in the annual classroom program, which would allow teachers to implement it within the curriculum from the beginning of the school year.

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Appendix 1. Example of anchor texts scores (70 weaker text; 100 average; and 130 greater text) and transcribed student texts. Translated from Spanish.

Example anchor text (score 100) for Structure measure

a) Presents an introduction with a meta-structure at the beginning (*e.g. in this text, I am going to present...)* of the text.
b) Presents ideas collected together according to similarities and differences in a consistent manner
c) Uses standard connection conjunction words, albeit mostly simple ones, when linking ideas (*e.g. class textbooks are for studying, but adventure novels serve for entertainment)*
d) Separates the text by paragraphs (without using links between them)
e) Does not present a conclusion section at the end of the text.

Example transcription (anchor text reference score 100)

In this text, I am going to compare and contrast class textbooks and adventure novels. Among their similarities, both are books, both have a topic, both have written letters, and both have a cover.

Among their differences, one is for studying and the other for entertainment.

Example Anchor text (score 130) for Quality measure

a) Explicitly presents the topic and objective of the text through an introduction, which is differentiated from the body of the text *(e.g. in this text, I will compare and contrast two ways of travelling, these are by plane and by car).*
b) Presents and keeps a clear sequence of ideas throughout the text (organized according to similarities and differences). In addition, presents several ideas for similarities and differences.
c) The ideas are coherent, detailed and use examples *(e.g. another similarity is that both ways of travelling cost some money, because when flying you pay for the flight ticket, while when going by car, you have to pay for the fuel)*
d) Presents correct sentence structure, with most of them being complex
f) Presents good general organization of the text, an introduction, a well-written body and a well worked conclusion *(e.g. in this text we are going to compare and to contrast two different ways of travelling: the main similarity is… the main difference is… /To summarize…)*
g) Correct use of different, mainly complex, links between the ideas *(e.g. the main similarity, another important similarity, either travelling by car or by plane, the main difference, …)*

h) Use of complex links or discursive markers both at the beginning and at the end of the text *(e.g. In this text, we are going to compare and to contrast two different forms of travelling… In conclusion….)*

i) Accurate vocabulary, whether simple or standard *(e.g. vehicles, fuel, consume)*

j) Does not make spelling mistakes. Correct use of accents throughout the whole text

Example transcription (anchor text reference score 130)

In this text we are going to compare and contrast two ways of traveling, which are traveling by plane and traveling by car.

The main similarity is that both are vehicles and need someone to drive them. Another similarity is that both cost money.

The main difference is that traveling by plane takes less time but traveling by car it takes longer. Another difference is that in the plane you travel by air and in the car you travel by land.

In conclusion, both traveling by car and traveling by plane are two good ways to travel and both cost money.

Example Anchor text (score 70) for Coherence measure

a. The topic of the text is not clearly identified

b. In the body of the text, the sequence of ideas follows a distinguishable and coherent plan (e.g. firstly discusses similarities, and later differences)

c. In the body of the text, the ideas (e.g. similarities and differences) are presented in a relatively simple manner, i.e., simply resorting to enumeration without using proper connectors (and/also…)

d. Reference markers (e.g. one, the other,) are incorrectly used, since they do not specify which objects are referred to.

e. There are no digressions and/or loops back in the content. There is no repetition or mixing up of ideas

f. There is no kind of conclusion/sentence that brings sense to the text

Example transcription (anchor text reference score 70)

Similarities: the two are entertaining (referring to textbooks and adventure novels), the two can be found in a library, the two are of different types. Differences: one is to study and another to read at night.

Appendix 2. Example of script that tormed the basis for the modelling component (adapted from Fidalgo and Torrance 2017) translated from Spanish.

General Instructions

During thinking aloud, you should remember that you have to be explicit about what thoughts you should follow to correctly plan a text. In this case you should explicitly reference the POD + vowels strategy. During the modeling, you should use self-questions and explicit self-instructions responding to those self-questions in relation to:

– Regulation of what you are doing. For example: self-questions: *What is the first thing that I have to do?* Self- instructions: *the first thing that I have to do is Plan my text*.

– Regulation during the writing process of what you have done so far. For example: self-questions: *Have I thought of enough ideas?* Self-instructions: *Yes, I've done that right, I have followed my plan well*

– Regulation at the end of the process about what you did. For example: self-questions: *Have I organized my ideas well?* Self-instructions: *Yes, I have enough differences and similarities between the ideas, so I can continue.*

– Regulation of interests/motivations/self-efficacy beliefs, such as: *I am doing it very well; I am going to write a great text…*

Example

Once these general instructions are clarified, an example of how thinking aloud for the comparison-contrast text of the topic "letter versus e-mail" is shown below.

I have to write a compare-contrast essay that explains the similarities and the differences between letters and e-mails. I must focus on this task and on the text that I have to write. I am confident that I can write this well. The first thing I have to do is Plan my text. My teacher has told me that it is the most important thing and also, they have given me a tip for planning, POD + the vowels. The first letter of POD is P, (Piensa- think), I have to stop and think about what I'm going to write. Ohh!! I have so many thoughts ... I have to Organize them, as the O in POD says ... but ... How do I do it? Oh yeah! With the vowels!!! They will help me! Mmmm it was the O ... the A .... Well, the first thing I'm going to do is, as letter E (Esquema-Outline) says, an outline of my text in which I will write down my ideas about the introduction of the text, how I develop it, and the conclusion [pretending to write a plan in the sheet]. *But first of all, it is important when I'm planning to always think of A, which means audience, that is, who will read my text. My audience is the teacher so I'm going to write the best text in my class!! I will continue with the vowels. They are helping me a lot!! The meaning of O ... is the Objective! The purpose of my text is to explain the differences and similarities between letters and emails. I'll write the objective in my*

introduction [pretending to write in the sheet]. *Well, now, I am going to continue with the development paragraph (letter D in POD). What ideas can I write in my text? First, I'm going to think about general ideas that I know. So, first, I am going to think…what do e-mails and letters look like? Or what do they have in common? What are the main ideas here? Well, between similarities, the main ideas are (…). But first of all, it is important to remember what U means (Unir-link), the ideas about similarities should go in one paragraph, and the differences in another paragraph.*

[write notes regularly asking: Is that suitable? Have I already got that one? After writing down several ideas …] *I don't have any more ideas. I am going to check to see if I have enough.* [Read aloud the list of similarities. Ask whether ideas are main or secondary. Possibly generate more ideas then …]. *Now what about the other differences between e-mails and letters?* [repeat the same process then …] *I'll read all of these again* [read list]. *Are the ideas correctly organized as letter O in POD says?* [Check the sheet] *Yes! ideas which explained the similarities are in one paragraph and the differences are in another paragraph. I am doing this very well! So, have I finished? Ah, no. As I wrote in my outline*, I must develop the last part of my text, the conclusion. *I need to sum up ideas and write my thoughts about them. Something like …* [pretending to write a concluding sentence] *Great! I have already finished my planning and I think that I am doing everything correctly, I am sure, the POD + vowels tip has helped me a lot! I'll just read it again* [read through notes, with self-praise and other comments, maintaining student's' interest].

CHAPTER 4: IS POSSIBLE THE TRANSFER LEARNING? EXPLORING THE EFFECTS OF STRATEGY-FOCUSED INSTRUCTION IN WRITING

Introduction

Active participation in today's information society requires adequate writing competence. However, learning to write is a complex task that demands not only the mastery of transcription skills (e.g., orthography or sentence construction), but also the deployment of self-regulatory skills such as planning, self-evaluation or self-monitoring in order to produce quality writing (Graham, 2018). The cognitive complexity of writing is a major problem for young writers who lack of automatized transcription abilities due to during the composition, need to deal with several problems: content, argumentation (what and how to say to the audience), while also focus attention on transcription skills such as spelling or paragraph (Rijlaarsdam et al. 2011). As a consequence of having to do all these cognitive activities simultaneously causes a cognitive overload and the potentially leads to an inefficient management of writing process (Kellogg, 2008; McCutchen, 2011). In this regard, the writing process in young writers who lack of automatized transcription abilities is predominantly focuses to text production, that is, they use a "knowledge-telling "approach (i.e., think ideas and their direct transcription to the text). Because of this, students allocate few cognitive resources to planning or revising their text, and as a result, their texts have low quality and are inconsistent according to the communicative objective and the audience for which it is intended (e.g., Beauvais et al., 2011; Kellogg, 2018; Koster et al., 2017).

In this context, an effective practice is to teach students strategies for planning, transcribing, or revising their texts, to help them manage the composition and reduce the cognitive overload during the writing process (Graham & Harris, 2017). At this respect, strategy-focused instruction has been point out by more than 20 meta-analyses as the most effective instructional practice when compare to other forms of writing instruction (e.g., text structure instruction, teaching transcription skills) (e.g., Graham et al., 2012; Koster et al., 2015).

Strategy-focused instruction is not a single technique (MacArthur, 2017), is a multicomponent package of instructional contents (knowledge about self-regulation procedures, strategies associated with mnemonics, discourse knowledge) in combination with different instructional component or instructional techniques identified as effective evidence-based practices (Graham & Harris, 2017): (a) *Direct teaching* knowledge about writing processes (planning, transcribing or revising) and characteristics of a quality text; (b) *Modelling* with Think aloud by the teacher who provides examples about how to

develop specific writing strategy and writing processes; (c) *Peer or individual practice* for students practice these processes or strategies while the instructor guides and encourages them (e.g., Graham et al., 2013).

In the last decades, several effective strategy-focused instructional programs have emerged being the most important the Self-Regulated Strategy Developed Model (SRSD) (Harris & Graham, 2017). The SRSD has multitude studies which support its effectiveness with different population (students with and without learning difficulties) and educational stages in order to instruct in different types of genres (e.g., Brunstein & Glaser, 2011; Festas et al., 2015; Palermo & Thomson, 2018; Rosário et al., 2019; Saddler et al., 2019). The ultimate goal of SRSD is teach students strategies for planning, transcribing, or revising their text in tandem with self-regulated procedures in order to achieving self-regulated performance (Harris & Graham, 2017). These strategies include specific knowledge about writing processes (such a planning or revising) and discourse knowledge about genre characteristic (e.g., Graham et al., 2012). Although the efficacy of strategy-focused instruction is well demonstrated, the fact that this type of instruction combines different techniques and instructional contents, that is, it be a multicomponent nature (Fidalgo et al., 2017; MacArthur, 2017), presents the problem of knowing which instructional techniques or combinations of them are essential in learning to write (De La Paz 2007; Fidalgo et al., 2017). In this regard, few but effective investigations have focused on prove the different techniques or instructional components (or combinations of its) (e.g., De Smedt & Van Keer, 2018; Harris, et al., 2006; Lopez et al., 2017; Sawyer et al., 1992). From these studies it is possible to conclude that for struggling sixth-grade students' direct teaching without modelling is sufficient to improve writing quality (Sawyer et al., 1992) or for example, the advantage of adding peer practice to direct teaching (due to the opportunity of students to learn from each other) for struggling second-grade writers (Harris et al., 2006). In the context of typically developing upper-primary students both, modelling and direct teaching techniques, are equally effective to instruct students how to write (Lopez et al., 2017) and the combined of direct teaching and peer-assisted techniques, would be the most effective instructional combination when compared with another instructional approach (i.e., matched practice without instruction or writing individually) (De Smedt & Van Keer, 2018). In the same lines, another investigations have focused on examining a central assumption about strategy- focused writing instruction, namely, if it is necessary to teach student explicit strategic knowledge

about planning or revision processes when the discourse knowledge is taught thoroughly (Fidalgo et al., 2015; Rodríguez-Málaga et al., 2020). Fidalgo et al. (2015) showed that for typically developing sixth-grade students teaching explicit planning and revision processes was not necessary, in fact result in them taking longer to produce their texts, with no gain in the quality of the finished product. On the contrary, Rodríguez-Málaga et al. (2020) demonstrated that for young writers (typically developing fourth-grade students) teaching process strategies, particularly pre-planning was necessary to achieve quality texts over short and long-term periods.

A limitation of studies cited above is that instructional writing program in the experimental conditions focused on only one text genre (compare-contrast text in the study of Rodríguez-Málaga et al. (2020), descriptive (De Smedt & Van Keer, 2018), argumentative (Lopez et al. 2017) or narrative text in the case of Sawyer et al. (1992)). Because of this, these results cannot as a matter of course be transferred to other genres. In this regard, as a Bouwer et al. (2015) demonstrated, generalizable inferences are not appropriate because the ability to write differs from genre to genre. These authors suggested that in order to draw conclusions about writing in a more valid and reliable way, multiple texts in different genres should be administered and with different panels of raters (Bouwer et al., 2018). A strong test to prove that students are benefiting from strategy-focused instruction per se would be to prove whether students are able to generalize the taught strategies to other genres that are different from those focused on during instruction (Torrance et al., 2015). The present study tests this central question through the implementation of strategy-focused program CSRI (Cognitive Self-Regulation Instruction*)* which was shown to be effective in improving the writing skills of 6th grade primary school students in regular classroom contexts (Fidalgo & Torrance 2017).

In this context (about the transfer effects of strategy-focused instruction), few studies have focused on examining whether strategy-focused instruction is effective for students to transfer writing strategies to other situations and contexts. For example, Harris et al. (2006) and Tracy et al. (2009) examined the effectiveness of SRSD in struggling second-grade students (Harris et al., 2006) and in regular third-grade students (Tracy et al., 2009). Following each stage of the SRSD model (develop background knowledge, discuss it, model it, support it with a collaborative writing and independent performance) students in the SRSD condition were taught both, a general planning strategy and a genre-

specific strategy in tamden with self-regulation procedures. In both studies the meaning of transfer was introduced to explain and discuss how the strategies could be used in other places or situations. The findings of both studies showed that SRSD students wrote qualitatively better than control in the instructed genres as well as the untaught genres. However, as a Tracy et al. (2009) argues the results need to be treated with caution given that the impact of the strategies was transferred to a genre that although was not taught, was similar to the genre that was the focus of the instruction. For this reason, the results provided a near transfer measure. In contrast to these studies in which transfer was stimulated, Fidalgo et al. (2015) and De Smedt et al. (2020) investigated spontaneous transfer of writing strategies, that is, without discussing how the general writing strategies could be applied when composed the uninstructed genre. Moreover, in both studies the instructed genre was a different typology with respect the uninstructed. Fidalgo et al. (2015) carried out a study with three sixth-grade classes (N = 62) to assess the cumulative effects of a sequence of different instructional components of CSRI: (1) observation of a mastery model, (2) direct teaching, (3) peer feedback, and (4) only practice. Their results indicated that students who received the CSRI program improved the coherence, structure, and overall quality for both compare-contrast essays (instructed genre) and opinion text (uninstructed genre). This improvement was associated exclusively after the initial component, that is, the modelling component (observation of a correct example of application of the strategies), without any type of direct teaching. The authors concluded that observation of a model followed by reflection promoted writing skills. In the case of De Smedt et al. (2020) a total of 431 fifth and sixth graders students were randomly assigned to three conditions: a) explicit instruction + individual writing (EI+IND); (b) explicit instruction + writing with peer assistance (EI+PA). These two experimental conditions were compared to a business as usual control condition. The results showed that EI+PA students outperformed both EI+IND and control students on the quality writing in the instructed genre (descriptive essays) but not in the uninstructed genre (narrative essays). There were no significant differences between EI+PA, EI+IND, and control students on the quality of students' narrative writing.

In summary, in this study we explore two central questions of strategy-focused instruction about (a) whether it is possible the spontaneous transfer of writing strategies to uninstructed genre, and (b) what components or combination of them facilitates this transfer (or if there was any effect). To our knowledge this is the first study to investigate

both. For this purpose, we implemented the same design of evaluation and instructional program (CSRI program) that previous research (Rodríguez-Málaga et al., 2020). In this study two experimental conditions that differed in the sequence of instructional components were compared to control condition. In experimental condition 1, the students first received the direct teaching component, followed by peer practice, followed by modelling. In contrast, in experimental condition 2, students first received the modelling component, followed by peer practice, followed by direct teaching. Therefore, this study extends the results of this previous investigation in which the authors examined the effects of CSRI program and its components in fourth grade students for the compare-contrast text typology. With the new results about writing performance on uninstructed genre this study provides a particularly strong test of whether or not fourth grade students benefit of strategy-focused instruction.

Present study

The aim of this study is to explore whether it is possible the spontaneous transfer of writing strategies to uninstructed genre; and the component, or order of implementation, that has the greatest effect to achieve it based on the cumulative effects of the instructional components.

Based on prior empirical research about the benefits of strategy-focused instruction to promote the transfer of learning strategies (e.g., Fidalgo et al., 2015; Harris et al., 2006) we predict that CSRI students will write better opinion texts than the control group (reflected in greater structure, coherence, and quality of the text) in the short-term (pre/post-test) and the long-term (eight months after finishing the training). The writing from the students in the control condition would be less coherent, less structured, and of poorer quality than the writing from students in the experimental conditions.

Method

Participants and Design

This study was carried out with the same participants and design that the study of (Rodríguez-Málaga et al., 2020). The sample comprised a total of 6 classes in 4th grade primary education (N = 126) from three different mixed state- and privately-funded schools in the North of Spain. Students' ages ranged from 9 to 10 years old. Participants' details are shown in Table 1. The initial sample comprised 153 students. 16 students who had existing diagnoses of learning disabilities and Special Educational Needs (SEN) were

not included in the statistical analysis although they did receive the same instruction as their peers. Prior to the intervention, all students followed the ordinary Spanish school education curriculum (focused mainly on teaching text production and rules for correct spelling and grammar).

Table 1 Descriptive characteristics of the participants for the three conditions.

	N = 126	*n* male (*n* female)	Mean age (*SD*)
Experimental Condition 1	47	26 (21)	9.36 (0.48)
Experimental Condition 2	36	16 (20)	9.56 (0.58)
Control Condition	43	21 (22)	9.27 (0.46)

Note. SD = Standard Deviation.

The 6 classes were randomly assigned to one of the two experimental conditions or to a control condition, with a result of two classes in each condition. Both experimental conditions received the strategy-focused instruction (CSRI) but differed in the order in which instructional components were implemented: Direct Teaching, Practice and Modelling (experimental condition 1); Modelling, Practice and Direct Teaching (experimental condition 2). In the control condition students received examples of high-quality texts without any strategy-instruction. The effect of the instruction was assessed by the change in the written skills across five time points: immediately prior to intervention (pretest), following each component (test 1 and test 2), at the end of the intervention (posttest), and eight months after finishing the intervention (follow-up). The design of the evaluation is outlined in Table 2.

Table 2 Research design showing instructional sequences and writing assessment probe for each condition.

Condition	Week 1-2		Week 3-4		Week 5-6		8 months later
EC 1	PRE	Direct Teaching	Test1	Peer-Practice	Test2	Modelling	POST	Follow-Up
EC 2	PRE	Modelling	Test1	Peer-Practice	Test2	Direct	POST	Follow-Up

						Teaching		
CC	PRE	Control	Test1	Control	Test2	Control	POST	Follow-Up

Note. EC1 = Experimental Condition 1; EC2 = Experimental Condition 2; CC = Control Condition; PRE = Pretest; POST = Posttest.

Training: CSRI program

As mentioned above, this study extends the results of a previous study This study was carried out with the same participants and design that the study of Rodríguez-Málaga et., 2020). The CSRI program attempts to develop students' strategies for planning and drafting appropriate compare-contrast texts. The program had three components (direct teaching, modelling and peer practice) with two sessions for each component (there were a total of six sessions, following a schedule of one session of one hour per week). The three components varied in terms of how the content was delivered.

The first experimental condition included the three components in the sequence: direct teaching, peer practice and modelling. The direct teaching component contained two sessions in which students were introduced to the strategy planning process (session 1) and then to the drafting process (session 2). At the beginning of session 1, the instructor taught a metacognitive matrix identifying the nature, purpose, and central features of effective planning processes. Then students were introduced to the mnemonic POD + the vowels OAIUE, as a scaffold for planning their compare-contrast texts. POD stands for each of the steps: (1) *Think of ideas -Pensar-* before writing; (2) *Organize* your thoughts with the OAIUE mnemonic rule [O *(Objective)* prompted students to identify the purpose of different text types; A *(Audience)* prompted students to capture future readers' interest and attention, motivate them to read, and make it easier to understand; I *(Ideas)* prompted students to think of ideas, brainstorm or search for other documentary sources, and differentiate between main and secondary ideas and examples; U *(Union)* reminded students to connect the ideas in the text, joining thematic ideas (e.g., similarities vs. differences in comparison - contrast text); E *(Esquema-Plan)* reminded students to make a *plan* including ideas about the introduction, development and conclusion]; and (3) *Develop* the text.

In the second session of the direct teaching component, students were given a metacognitive matrix identifying the nature, purpose, and central features of effective

drafting processes. Then, the instructor taught the mnemonic IDC + the vowels OAIUE (see Figure 1). IDC encourages the organization and structure of a comparison-contrast text: (1) *Introduction* in which students should present the topic, the purpose of the text and capture the readers' interest; (2) *Development* in which students were instructed to develop the ideas and examples to explain these ideas and; (3) *Conclusion* which reminded students to make a personal contribution to the text, an overall point of view, or reflection of everything discussed in the text. Again, the vowels provide criteria about the content during all three of the IDC production phases. Both strategies were supported by illustrated summaries showing the POD and IDC+ vowels mnemonics to facilitate students' learning.

The peer practice component required students to work in pairs planning (session 3) and drafting (session 4) a compare-contrast text. The instructor selected students with similar abilities and paired them. Students were assigned to writer or helper roles. The more extrovert student or the one more likely to think aloud was the writer and the other was the helper. While the pairs were planning their texts, the students had in front of them a sheet with spaces for the student's own notes in the margins laid out following the Vowels criteria. In the second session of this component (session 4), the writer took the outline created in the previous session and translated it into text. This session then followed an identical pattern to session 3, with a focus on the IDC mnemonic. In both sessions, during think aloud composing, the instructor also patrolled the class, listening to the think aloud and providing feedback and help for the writer about how to perform the thinking aloud and apply the strategies taught.

Finally, in the modelling component the teacher demonstrated the correct writing process steps for the planning strategy (session 5) and drafting strategy (session 6) previously explained in the direct teaching component. Modelling involved think aloud while composing a compare-contrast text in front of the class. Think aloud was mainly scripted. The teacher emphasized explicit references to the strategy with a self-regulatory approach to the task (*The first thing I am going to do is, as the letter E -Esquema- says, a Plan of my text ….*), and with self-statements about positive expectations *(If I make a last effort I will do it)* producing a written plan (session 5) and draft text (session 6). The teacher explained to the students that during the modelling they had to concentrate on all the teacher's steps and thoughts during the writing process. After modelling, students made notes about the model's most important thoughts. Then, the instructor facilitated a

whole-class discussion, drawing together the students' observations. At the end, each student individually wrote down reflections about the differences between their own writing practice and the processes that they had seen.

The second experimental condition included the sequence of components: modelling, peer practice and direct teaching. First, the two sessions of the modelling component followed the same pattern as the modelling component in experimental condition 1, with the exception that the explicit reference to the strategy and mnemonic rules associated was removed. In this case, the teacher did a modelling following the steps of the planning process (session 1) and drafting process (session 2) with think aloud in front of the class. Second, the peer-practice component sessions had one difference compared to experimental condition 1. In this case, students were able to watch the teacher modelling without explicit mention of the strategy or mnemonic rules. Students had to emulate the writing processes that they had seen modeled. During emulation, as in experimental condition 1, students worked in writer-observer pairs with think aloud planning their compare-contrast texts (session 3) and translated the plan to a complete text (session 4). During emulation, the teacher provided direct input for the writer (including prompts to think aloud if they forgot to do so) and to provide a model for the observer. Finally, in the direct teaching, as in experimental condition 1, the students were introduced to the concepts underlying the POD + OAIUE mnemonic rule (session 5) and the IDC + OAIUE mnemonic rules (session 6).

The control condition was production-focused without any strategy instruction. In the first sessions (1 to 3) the instructor focused on teaching different types of texts and their characteristics (narrative, descriptive and compare-contrast text). Then, the instructor presented the students with two tasks in which they had to identify textual examples for each of the previously taught text types. In sessions 2 and 3 the instructor presented the structure and production of each of the three types in detail. To make it easier for students to memorize content, the teacher gave the students different text types to identify and analyze the characteristics of. In the last few sessions (4 to 6) the instructor focused only on the compare-contrast type text. In the 4^{th} and 5^{th} sessions students wrote a compare-contrast text in pairs (one text in each session) aiming to emulate the type-specific features of the example explained in the previous sessions. Once they had written the text, each of the pairs read their texts aloud so that the instructor and the class group could provide feedback on whether the text had the required characteristics of a compare-

contrast text. In session 6 the instructor gave students an incomplete compare-contrast text. The students were divided into groups and completed the missing parts of the text without the help of the instructor. After the task was finished, the instructor guided a group discussion about whether the text was completed properly.

Instruments and measures

***Writing Assessment Task*.** In the writing assessment task, students had to write an opinion text about various topics that were selected beforehand based on students' interests: pretest (homework) , test 1 (have a pet), test 2 (do sport), posttest (zoo animals), follow-up (recycle).

Evaluation session. The evaluation session lasted one hour in which a specialist researcher gave the students small cards which included the title of the topic with a picture about it. Then students were asked to write an opinion text in relation to the question "for or against"? The specialist researcher provided students with two work sheets, one for planning and one for the final text. Students were told that using the first work sheet was optional. The specialist researcher reminded the students that they had one hour to write their text and encouraged them to produce the best opinion essay that they could. The specialist researcher did not provide any help during the evaluation writing task.

Product assessment. Texts were analyzed using the anchor text procedure from Rietdijk et al. (2017). In this procedure, texts were rated in separate rounds for each dimension or measure (structure, quality, coherence) for which a specific criteria and definition was provided to the evaluators (independent researchers of writing instruction and assessment). First, they chose a sample of 50 texts from the total. From these 50 texts, five anchor texts were identified representing scores at the mean and 1 and 2 standard deviations above and below the average: two weaker texts (scores 70-85), an average text which was assigned the arbitrary score of 100, and two better anchor texts (scores 115-130). Then two evaluators independently rated all of the texts in three separate rounds, one round per variable (structure, coherence and quality) with the five anchor texts providing benchmarks. The mean score was arbitrarily set at 100, and the remaining anchor texts at 70, 85, 115, and 130. This procedure was repeated for each evaluation time point (pretest, test 1, test 2, posttest and follow-up).

Procedure

Training delivery. The study was conducted during the spring school term and the sessions took place in literacy lessons. The full implementation of the program was carried out by 6 teachers (educational professionals with master's degrees in primary education), one for each class.

Teacher training. Prior to the start of the intervention, a specialist researcher who guided the study methodology presented the CSRI program to the teachers covering general information, background, and implementation schedule. Then, in order to facilitate the implementation of the CSRI program, all the teachers were given the complete set of materials for each student (individual portfolios) and a "teacher session manual" containing detailed descriptions of the 6 sessions. The researcher asked teachers to read the session information carefully before the start of training to discuss and clarify any questions during the training sessions. There were a total of three training sessions (one training session for the direct teaching component, another to support modelling and a final session to support the peer practice component). Each training session was delivered a week before it was implemented. Teachers were trained individually by the specialist researcher and all sessions lasted for approximately 60-80 minutes following the same two-part pattern.

Treatment Fidelity. We used the following measures to ensure that the teachers implemented the program appropriately: First, all teachers were given manuals including the elements and activities for each session. Second, a specialist researcher met with the teachers weekly to train them in applying the instructional procedures and to interview them about their experiences of the intervention sessions. Third, the student portfolios with the set of materials were reviewed following the sessions, allowing us to check whether the students had correctly completed the tasks, such as in the modelling sessions, where students had to watch the teachers' thinking and actions and write them down. Evidence from teacher interviews and students' portfolios suggested that the intervention was delivered correctly. To ensure a procedure that respects ethical standards, we sent a letter to the families in which they were informed of the objectives and nature of the study. We requested written informed consent from the families for their children's participation in the study. After the intervention, the strategy-focused instruction CSRI was delivered to each of the teachers in the control group. This procedure ensured that all participants had the opportunity to benefit from the strategic intervention.

Data Analysis

The data was analyzed using SPSS 24.0 (IBM, Chicago, IL). The normal distribution of the three measures (structure, coherence, and quality) allowed us to conduct a parametric analysis. First, in preliminary analysis, the normal distribution and differences regarding gender and teacher-class were analyzed. The variable teacher-class was taken as a covariate. Considering the aims of the study, to determine the benefits of the CSRI program on every measure, three the one-way Analyses of Covariance were conducted for structure, coherence, and quality at each evaluation timepoint. The independent variable was the condition (control condition, experimental condition 1 and experimental condition 2) and the dependent variables were the student performance in each measure (structure, coherence, and quality).

In order to assess the learning gain from the CSRI program more deeply, we analyzed the interaction between the conditions by timepoint. Specifically, we used repeated measures analysis of covariance ANCOVA for each measure at the timepoints pretest vs. posttest, pretest vs. test 1, test 1 vs. test 2, test 2 vs. posttest, and posttest vs. follow-up. The independent variables were the evaluation timepoint and the condition, while the dependent variables were student performance in each measure (structure, coherence, and quality).

We used Bonferroni's multiple comparison to determine the groups between which significant differences were found (*post hoc* Bonferroni comparison, $p < .05/3 = .016$). Effect sizes were assessed using partial eta squared: $\eta_p^2 < 0.01$ = small effect, $\eta_p^2 \geq 0.59$ average effect; and $\eta_p^2 \geq 1.38$ = large effect (Cohen, 1988).

Results

Preliminary Compare-Contrast Text Results

The asymmetry and kurtosis values of the variables were within the intervals that denote a normal distribution (Kline, 2011). Table 3 summarizes the means and standard deviations for each variable by condition and evaluation time. Differences in pretest variables were analyzed with regard to three independent variables: condition, gender and teacher-class (given that the teachers varied across conditions). The results indicated that the differences were not significant for the condition groups in relation to structure (p = .508), coherence (p = .330) or quality (p = .723). However, at pretest level we found differences regarding gender in structure F (1, 124) = 16.073, $p \leq .001$, $\eta_p^2 = 0.115$ and quality F (1, 124) = 6.446, p = .012, $\eta_p^2 = 0.049$. Moreover, we found differences

regarding teacher-class in structure $F(5, 120) = 5.159$, $p \leq .001$, $\eta_p^2 = 0.177$; coherence $F(5, 120) = 6.293$, $p \leq .001$, $\eta_p^2 = 0.208$; and quality $F(5, 120) = 7.241$, $p \leq .001$, $\eta_p^2 = 0.232$. In consequence, we controlled the gender and teacher-class variables as a covariate.

Table 3 Means and Standard Deviations and One-way Analyses of Covariance for structure, coherence, and quality variables by Treatment Condition.

	EC1	EC2	CC	$F(2, 121)$	η_p^2
	M(SD)	*M(SD)*	*M(SD)*		
Structure					
Pretest	84.04(10.44)	84.88(10.68)	86.48(8.92)	0.70	0.01
Test 1	89.00(12.63)	92.83(13.07)	87.79(12.71)	1.52	0.02
Test 2	103.70(14.34)	108.88(15.00)	96.32(17.06)	4.98*	0.07
Posttest	107.97(15.08)	107.05(15.19)	94.60(17.54)	10.21***	0.14
Follow up	94.63(10.94)	97.36(13.61)	91.25(13.91)	4.04*	0.06
Coherence					
Pretest	83.46(9.34)	86.05(10.78)	86.53(11.24)	0.83	0.01
Test 1	91.89(9.96)	91.00(11.00)	87.58(10.65)	4.03*	0.06
Test 2	100.12(12.82)	105.00(13.21)	95.37(15.59)	3.17	0.05
Posttest	104.85(13.45)	104.52(14.42)	94.55(15.71)	7.88***	0.11
Follow up	92.12(7.80)	92.75(8.20)	88.41(9.18)	4.18*	0.06
Quality					
Pretest	84.55(10.27)	86.41(11.11)	85.72(10.81)	0.87	0.01
Test 1	88.25(10.93)	88.86(15.50)	86.27(11.79)	2.95	0.04
Test 2	98.36(13.36)	102.63(13.32)	93.18(15.48)	3.09	0.04
Posttest	103.36(15.79)	104.27(15.85)	94.65(17.25)	4.47*	0.06
Follow up	91.87(8.75)	92.72(10.38)	87.27(10.34)	4.15*	0.06

Note. EC1 = Experimental Condition 1; EC2 = Experimental Condition 2; CC = Control Condition; *M* = Mean; *SD* = Standard Deviation; η_p^2 (eta-squared statistic) = estimates of effect size.

* $p < .05$; ** $p < .01$; *** $p < .001$

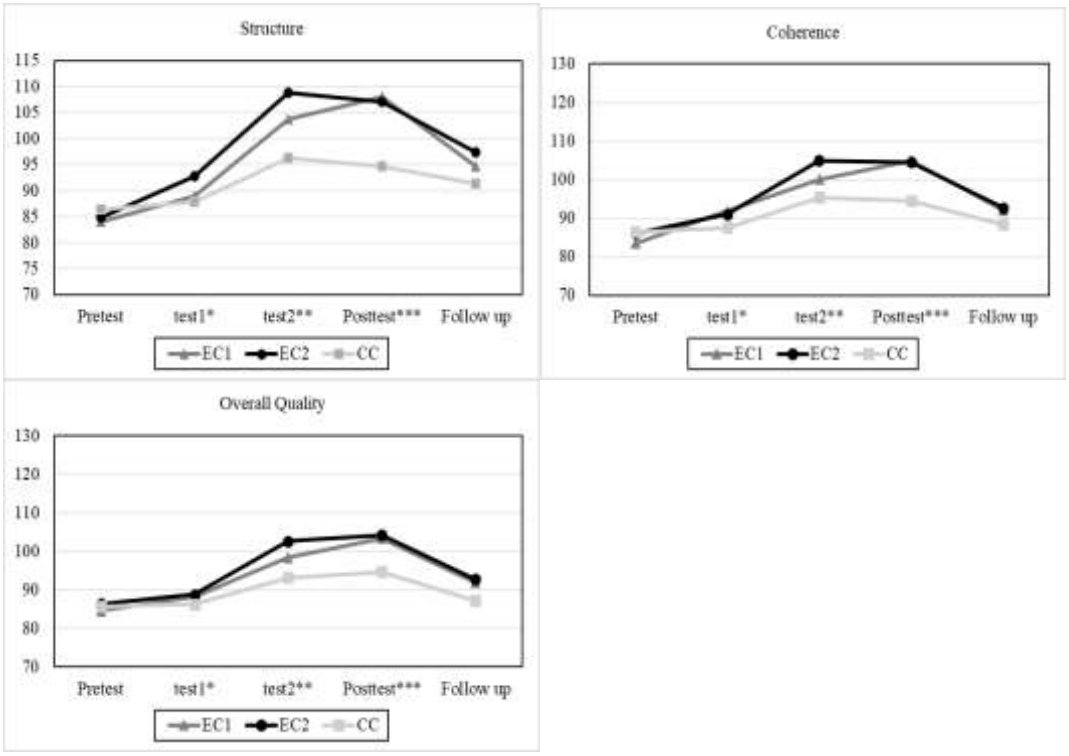
Intervention Effects

Table 3 shows the differences between the three conditions for each timepoint and in each variable (coherence, structure, and quality). With respect to the three variables, the one-way Analyses of Covariance showed that the differences between the three conditions were statistically significant at two timepoints, posttest (after the full CSRI program) and follow-up (eight months after), with small effect sizes (which were higher at posttest than at follow-up for structure and coherence variables). At posttest, *post hoc* analysis showed statistically significant differences between each of the experimental conditions compared to the control condition for the structure variable (experimental condition 1 vs. control condition $p < .001$; experimental condition 2 vs. control condition $p = .002$); for the coherence variable (experimental condition 1 vs. control condition $p = .003$; experimental condition 2 vs. control condition $p = .009$); However, for quality variable, the *post hoc* analyses were not significant for the comparison of each experimental condition with respect to the control condition (experimental condition 1 vs. control condition $p = .03$; experimental condition 2 vs. control condition $p = .03$). In the case of follow-up timepoint *post hoc* analysis not showed statistically significant differences between each of the experimental conditions compared to the control condition for any of the variables.

In short, after two sessions of the CSRI program (test 1) the one-way Analyses of Covariance showed that the condition was statistically significant in the coherence variable. *Post hoc* analysis not showed statistically significant differences between each of the experimental conditions compared to the control (experimental condition 1 vs. control condition $p = .16$; experimental condition 2 vs. control condition $p = .45$). After 4 sessions of the CSRI program (test 2) the three experimental conditions showed statistically significant differences only in the structure of their texts. *Post hoc* analysis showed statistically significant differences only between experimental condition 2 vs. control condition ($p = .01$).

The effect of the covariate (teacher-class) was statistically significant in all the comparisons examined with the exception of at pretest for the variable structure ($p = .513$) and posttest for the variable quality ($p = .941$)

Finally, Figure 1 shows the change in performance over time in structure, coherence, and overall quality by condition.



* After 2 sessions. **After 4 sessions. ***After 6 sessions (full program).
EC1 = Experimental Condition 1; EC2 = Experimental Condition 2; CC = Control Condition
.

Fig. 1 Change in performance in each variable by condition

Intervention Effects by Time Points

Repeated measures ANCOVA for the three variables structure, coherence, and quality (Table 4), demonstrated that the interaction (evaluation time x condition) was significant for the comparisons between the timepoints pretest vs. posttest and posttest vs. follow-up (with small effect sizes). Additionally, for the coherence variable the interaction pretest vs. test 1 was significant.

The effect of covariate (teacher-class) was statistically significant in all the comparisons with the exception of: structure (pretest vs. posttest, p =.05); quality (pretest vs postest, p = .14; test 2 vs posttest, p =.22; posttest vs follow up, p =.21).

Table 4 Results of repeated measures ANCOVA conducted for the three variables

	Interaction (evaluation time x condition)

	F(2, 121)	η_p^2	*Post hoc*
Structure			
Pretest vs. Posttest	13.65***	0.18	EC1 > CC: *p* = .05; EC2 > CC: *p* = .08
Pretest vs. Test 1	2.37	0.03	EC1 > CC: *p* = .08; EC2 > CC: *p* = .04
Test 1 vs. Test 2	3.09	0.04	EC1 > CC: *p* = .28; EC2 > CC: *p* = .005
Test 2 vs. Posttest	1.88	0.03	EC1 > CC: *p* = .002; EC2 > CC: *p* < .001
Posttest vs. Follow-up	4.36*	0.06	EC1 > CC: *p* = .004; EC2 > CC: *p* = .003
Coherence			
Pretest vs. Posttest	9.41***	0.13	EC1 > CC: *p* = .27; EC2 > CC: *p* = .11
Pretest vs. Test 1	4.94**	0.07	EC1 > CC: *p* = .97; EC2 > CC: *p* = .98
Test 1 vs. Test 2	1.26	0.02	EC1 > CC: *p* = .11; EC2 > CC: *p* = .01
Test 2 vs. Posttest	2.63	0.04	EC1 > CC: *p* = .02; EC2 > CC: *p* = .004
Posttest vs. Follow-up	3.01	0.04	EC1 > CC: *p* = .003; EC2 > CC: *p* = .004
Quality			
Pretest vs. Posttest	5.83**	0.08	EC1 > CC: *p* = .33; EC2 > CC: *p* = .12
Pretest vs. Test 1	1.30	0.02	EC1 > CC: *p* = .97; EC2 > CC: *p* = .98
Test 1 vs. Test 2	2.83	0.04	EC1 > CC: *p* = .36; EC2 > CC: *p* = .04
Test 2 vs. Posttest	0.72	0.01	EC1 > CC: *p* = .05; EC2 > CC: *p* = .008
Posttest vs. Follow-up	1.73	0.02	EC1 > CC: *p* = .01; EC2 > CC: *p* = .009

Note. η_p^2 (eta-squared statistic) = estimates of effect size. From *post hoc* comparison of all students in each group the Bonferroni correction was applied ($p < .05/3 = .016$). EC1 = Experimental Condition 1; EC2 = Experimental Condition 2; CC = Control Condition

* $p < .05$; ** $p < .01$; *** $p < .001$.

Discussion

This study explored a central question of strategy-focused instruction about whether it is possible the spontaneous transfer of writing strategies to uninstructed genre (opinion essay), and what instructional components (or combination of them) facilitates this. Strategy-focused instruction is a multicomponent approach that provide students strategic knowledge that they can use to regulate how and what they write (Macarthur,

2017). In our study, students in both experimental conditions (that differed in the order of implementation of the instructional components) were provide strategic knowledge about planning procedures, such as advance planning. Planning in advance, as the literature demonstrated, function as an external memory that help students to simplify the process of thinking about content during the composition and reduce the cognitive overload (e.g., Kellogg, 2008). This could explain why after six sessions of training, and similar to the results of Rodríguez-Málaga et al. (2020) the students of both sequences of the CSRI program exhibited improvements in their unstructured genre (opinion text) compared to the control. Because planning intrinsically involves reasoning about content, that is, the internal set of relationships of ideas and their consistency) (e.g., Torrance, 2015), both experimental conditions wrote more structured and coherent opinion text than the control group. However, and contrary to our expectation, although the means of the CSRI students in the quality measure were higher, both experimental conditions did not differ significantly from the control group. One reason for this lack of difference is explained by the combination of own nature of quality variable and the type of genre. Textual quality is the overall merit of the text and, for this reason, involves but is not limited to structure and coherence. Quality text also involves taking into account the complexity and richness of ideas, interesting detail, and correct usage of mechanics (Spencer & Fitzgerald, 1993). Certainly, we taught a strategic approach (the POD and IDC+ vowels mnemonic) to help CSRI students achieve adequate product goals (what should I include to make sure my text is adapted to audience needs?"), but without a knowledge of the genre achieve quality writing can be a challenge for young writers. Moreover, writing an opinion text can also be especially difficult for young writers (Carter et al., 2011; Ferretti et al., 2000). Although they have opinions and reasons about the topic because they usually tend an egocentric view in their compositions, they have difficulty to take into account the reader's needs (Kellogg 2008; Zoi et al., 2018). Therefore, the writing compositions about their opinions and argumentation may not be so convincing and affecting the final quality of the text. Additionally, it is possible that students' writing performance was affected by their domain of topic knowledge (Murphy & Alexander, 2002). If students think that they already know about the topic of text, they may not perceive the utility of using the strategies.

In relation to the effects of each component (direct teaching, modelling, or peer practice) the results only suggested significant benefits of CSRI for the structure variable

at test 2 (after four sessions of CSRI). This is similar to previous results (Rodríguez-Málaga et al. 2020) in which the authors found that the peer practice component provided the greatest learning gains. However, this result did not occur in the rest of the variables. In other words, is not until the end of the instruction that students showed significant learning gains in their compositions.

In relation to the long-term effects, and contrary to our predictions, our results showed that eight months after finishing the intervention both experimental conditions exhibited a decrease in all variables, reflected in the means for coherence, structure and quality. At the follow-up evaluation, although we did not find significant differences between the three conditions, the two experimental conditions produced texts with more structure, coherence and quality than the control group, above their pretest scores. Therefore, this result suggests that CSRI training might benefit from booster sessions or from increasing the length of the initial treatment to ensure greater maintenance effects.

Limitations and Future Directions

We conclude with some final limitations related to methodology and data analysis and how these can be addressed in future research. First, this study needs replication using a larger sample and more homogeneous group (other socioeconomic levels or students with learning difficulties). Second, the significant effects of the covariate (teacher-class) reflecting the importance of the role of the teacher in classroom. For this reason, it is important to control this variable with the aim of ensuring that the changes in students' performance were due to the CSRI program and not to the teachers' practices. Future studies might consider running multilevel analyses.

Another limitation is related to the lack of a) a specific assessment of writing strategies, metacognition strategies, and self-regulated learning. This limitation could be overcome through evaluating these variables using specific questionnaires (Bruning et al., 2013; Kieft et al., 2008; Núñez et al., 2013); b) social validity (i.e., the acceptability of and satisfaction with the intervention procedures (Koster et al., 2017) that could be overcome through interviews or questionnaires (e.g., Kiuhara et al., 2012).

Finally, we suggest that it may be fruitful to study the changes in the writing process using online measures which would allow the think aloud to be recorded (López et al. 2019) and also recording and analysis the feedback between students during peer practice. This information may provide interesting data about students' interactions.

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CHAPTER 5: EXPLORING THE SHORT-TERM AND MAINTAINED EFFECTS OF STRATEGIC INSTRUCTION ON THE WRITING OF 4TH GRADE STUDENTS: SHOULD STRATEGIES BE FOCUSED ON THE PROCESS?

This chapter faithfully reflects the content of: Rodríguez-Málaga, L., Rodríguez, C., & Fidalgo, R. (2020). Exploring the short-term and maintained effects of strategic instruction on the writing of 4th grade students: should strategies be focused on the process? *Reading and Writing*, 1-22. https://doi.org/10.1007/s11145-020-10088-4

Introduction

Writing is an essential skill to communicate, both in daily life and in professional or academic contexts (Graham & Harris, 2013). For this reason, the acquisition of writing skills is one of the main aims of education (Psyridou, Tolvanen, Lerkkanen, Poikkeus, & Torppa, 2020). However, writing is a complex task in which the per- son has to deal with many different processes: planning (prepare the content activating previous knowledge and organizing the main ideas); transcription (grammatical encoding of the ideas retrieving syntactic and semantic knowledge) and, reviewing (Hayes, 2012; Kellogg, 2018).

Given the complexity of writing, it is not surprising that this skill is a demanding process for novice or young writers, especially when the transcription process (e.g., orthography, sentence construction) is not automatic (e.g., Limpo & Alves, 2013; Olive & Kellogg, 2002). If the transcription process is not automatic, students focus most of their cognitive resources on text production, and few resources are available for fundamental processes such as planning or reviewing (Rijlaarsdam et al., 2011). Even in older students (upper-primary and undergraduate students) researchers who have explored the processing time devoted to writing processes, have shown that the role of planning and reviewing to be minimal and the use of these cognitive processes to be inefficient (Beauvais, Olive, & Passerault, 2011; Limpo, Alves, & Fidalgo, 2014; López, Torrance, & Fidalgo, 2019; Torrance, Fidalgo, & Robledo, 2015).

In this context, an effective practice to help young writers deploy planning or reviewing processes and manage composition is to teach them to use strategies that reduce the cognitive overload that usually occurs when composing (Kellogg, 2018). In this regard, several meta-analyses have reported that one of the most effective approaches to improving the quality of students' texts is strategy-focused instruc- tion, either alone or combined with self-regulation procedures (Graham & Harris, 2017; Graham, McKeown, Kiuhara, & Harris, 2012). The relation between using self-regulatory procedures during writing (e.g., planning and goal setting, self-monitoring, self-instruction) and producing good text are well established in literature (Harris, Graham, Mason, & Saddler, 2002; Palermo & Thomson, 2018; Rosário et al., 2019; Saddler, Asaro-Saddler, Moeyaert, & Cuccio-Slichko, 2019).

One of the most successful instructional approaches that combines strategy-focused instruction and self-regulated procedures is Self-Regulated Strategy

Development (SRSD) (Harris & Graham, 2017). The overall goal of SRSD is that students use the target strategies autonomously because the strategies are the key to achieving self-regulated performance (MacArthur, 2017). These strategies include process knowledge about such things as planning so that students establish procedural goals ("The first thing I have to do is plan my text, first I will make an outline of the ideas"), and discourse knowledge to ensure that students engage in product goal setting ("what should I include to make sure my text is adapted to audience needs?") (Graham et al., 2012). The effectiveness of SRSD is well established across different educational stages, for students with and without learning difficulties, and for different textual typologies (Brunstein & Glaser, 2011; Festas et al., 2015; Palermo & Thomson, 2018; Rosário et al., 2019; Saddler et al., 2019).

Strategy-focused instruction is not a single technique, it has a multicomponent nature (Fidalgo, Harris, & Braaksma, 2017; MacArthur, 2017) which combines different instructional methods identified as effective evidence-based practices (e.g., Graham & Perin, 2007; Graham et al., 2012; Koster, Tribushinina, de Jong, & van den Bergh, 2015): (a) *Direct teaching* knowledge focusing on planning and/ or reviewing, and knowledge about setting appropriate product goals for what the final content should be. Both types of knowledge are supported by strategies and mnemonics. (b) *Modelling* with Think aloud by the teacher who provides examples of these procedures and strategies in front of the class; and (c) *peer or individual practice* for students to emulate and practice these processes in a supportive context where the instructor guides and encourages them to achieve autonomy in writing (Graham, Gillespie, & McKeown, 2013). Although the efficacy of strategy-focused instruction is well demonstrated, this multicomponent nature prevents us from knowing the mechanisms by which the effect is achieved (Fidalgo et al., 2017). In this regard, for example, Graham, Harris and co-workers (Graham & Harris, 1989; Sawyer, Graham, & Harris, 1992) examined various decompositions of SRSD. In the first study, Graham and Harris (1989) compared strategy-focused instruction with and without components explicitly aimed at developing self-regulation skills (goal setting and self-monitoring). The authors found similar benefits in both experimental conditions. Sawyer et al. (1992) extended previous research on components and added a third "Direct teaching" condition. In this condition, the authors removed modelling and collaborative practice. Again, students in all three conditions (SRSD, SRSD without goal setting and self-

monitoring and Direct teaching) showed benefit relative to practice-only controls, with no evidence of difference among conditions.

In this context, the aim of the present study is to explore a central component of strategy-focused instruction about whether teaching procedural knowledge, specifically planning processes, is necessary when the discourse knowledge is taught exhaustively (Torrance et al., 2015). As Torrance (2015) argues, there are two compatible ways to teach students to plan. The first and most common way is to teach explicit planning procedures, such as advance planning (Bouwer, Koster, & van den Bergh, 2018; Saddler et al., 2019; Shen & Troia, 2018). Of course, teaching advance planning procedures can help young writers manipulate content before they start writing and reduce the cognitive overload when composing (Graham & Harris, 2007; Kellogg, 2018; Rijlaarsdam et al., 2011). However, studies which explore the benefits of advance planning and textual quality have shown mixed results that vary by students' ages and writing tasks (Limpo et al., 2014; López et al., 2019; Olinghouse & Graham, 2009).

Alternatively, the planning process can be taught focusing attention on setting product-goals, in the hope that during writing, students spend time planning con- tent based on those goals (Torrance, 2015). For example, Torrance et al. (2015) implemented the Cognitive self-regulation instruction program (CSRI; based on the SRSD model) to develop 6th grade students' self-regulated mastery of their writing (Zimmerman, 2000). The authors compared the effects of full CSRI instruction (including explicit instruction in planning and revision), with a modified version ("product only") which received the same instruction, but with all reference to planning strategies removed. In this condition students learned to set explicit product goals with the help of mnemonics (ensure text structure, use appropriate links, etc.), but without any explicit encouragement to plan their text. These two conditions were compared with practice-matched controls. Both experimental conditions exhibited improvements in the three measures (structure, coherence, and quality) of their writing compared to the control, with no evidence of benefits of full CSRI over those provided by the "product only" condition. At post-test, the full-CSRI group spent more time planning, however, the use of process strategies was not associated with additional benefit to text quality.

Based on the above it is possible to conclude that, through strategy-focused

instruction, students can be encouraged to use planning procedures in different and equally effective ways. Therefore, our aim is to explore and compare a full version of the CSRI program (pre-planning strategy and setting of theoretical goals supported by mnemonics) with a modified version of the same intervention without any direct reference to planning procedures (teaching only mnemonics for students to establish and work with the right product goals) in 4th grade students. Because learning writing depends not only on instructional (external) factors but also the students' own cognitive (internal) factors (Harris et al., 2002), it is important to ask whether strategy-focused instruction CSRI is effective for 4th grade students. Moreover, pro- viding effective instruction in the first few years of Primary Education is an essential educational goal to prevent future difficulties in higher grades (Arrimada, Torrance, & Fidalgo, 2019). Thus, our aim is to extend our existing understanding of the effects of the CSRI program to participants who are younger (4th grade students) than those who have typically been studied in previous intervention evaluations (6th grade students) (Fidalgo, Torrance, Rijlaarsdam, van den Bergh, & Álvarez, 2015; López, Torrance, Rijlaarsdam, & Fidalgo, 2017; Torrance et al., 2015). We also wanted to determine the maintenance effects 7 months after finishing the training. If the goal of strategy-focused instruction is to teach students strategies to encourage effective autonomous learning, not just during an intervention, but also in the long-term, the study of maintenance strategies becomes a key focus for educators' instructional decisions (de Boer, Donker, Kostons, & van der Werf, 2018).

The present study

The aim of this study is to explore the short-term (6 sessions) and long-term effects, in terms of writing structure, coherence, and quality, of two forms of the CSRI program on the writing skills of 4th grade students: full-CSRI (planning process instruction and product instruction) and brief-CSRI, without explicit planning process instruction.

Based on prior empirical research about the benefits of strategy-focused instruc- tion with typically developing students, we predict that CSRI students (both, full- CSRI and brief-CSRI) will write better compare–contrast texts than the control group (reflected in greater structure, coherence, and quality of the text) in the short- term (pre/post-test). The writing from the students in the control condition would be less coherent, less structured, and of poorer quality than the writing from students in the

experimental conditions. More specifically, in relation to the question about which experimental condition will perform better with respect to the control, based on the benefits of learning pre-planning procedures (e.g., Graham, Harris, & Mason, 2005; Kirkpatrick & Klein, 2009; Kiuhara, O'Neill, Hawken, & Graham, 2012), we predict that full-CSRI students will write better compare–contrast texts (the texts will have greater structure, coherence and quality) than brief-CSRI.

As Graham and Harris (2017) argued, a significant gap in strategy-focused writing instruction is that few studies have evaluated the maintenance effects of instruction, and most have been no longer than 8 weeks (Hacker et al., 2015). This study is the first to evaluate the long-term effects (7 months) of both forms of CSRI strategy-focused instruction in fourth grade students. At the maintenance timepoint, we expect the effects of CSRI (both full-CSRI and brief-CSRI) to be maintained over and above the control condition. More specifically, the full-CSRI students will write more structured, coherent and better-quality compare–contrast texts than the brief-CSRI group and both will be better than the control. This is based on previous studies about the maintenance of effects of strategy-focused instruction that have shown that the effects last over time, more so than traditional instruction (Fidalgo, Torrance, & García, 2008; Glaser & Brunstein, 2007; Tracy, Reid, & Graham, 2009).

Method

Design

Schools participating in this study were recruited considering a minimum number of classes in each grade and ensuring that schools were closely matched demographically. A member of the research team contacted the school principals and provided information about the study and the CSRI program. Where school principals showed interest in the study, the information was presented to the school's 4th grade teachers. Once the teachers agreed to participate and in order to ensure accordance with ethical standards (Declaration of Helsinki; Williams, 2008) we sent a letter to all of the participants' families in order to fully inform them of the objectives and characteristics of the study. Written informed consent signed by the parents/guardians of all students was received prior to their participation in the study. Additionally, after the intervention the strategic instruction program was delivered to each of the teachers in the control group. This was to ensure that all study participants had the opportunity to benefit from the strategic intervention.

The effect of the instruction was assessed by the change in the written skills across three timepoints: immediately prior to intervention (pre-test), at the end of the intervention (post-test), and 7 months after finishing the intervention (maintenance). We wanted to wait as long as possible to evaluate the students, as long as it was optimal for them. We discounted the initial months of the school year, as the students would be adapting to their new year and new teacher (having started 5th grade). The best time was in the middle months of the school year as the students would have adapted to their current school year. The teachers in the participating classes did not assign any compare–contrast compositions to their students in the period before the maintenance session.

Participants

Initially our sample comprised a total of 10 groups of 4th grade classes (N = 240) from three different state- and privately funded mixed-schools. One class was excluded because it did not meet the study's strict fidelity requirements. Thus, our sample comprised a total of 9 groups (N = 215) that were randomly assigned to one of the two experimental conditions or a control condition: 3 classes (n = 72) in full- CSRI (experimental condition 1), 3 classes (n = 69) in brief-CSRI (experimental condition 2) and 3 classes in the control condition (n = 74). Students' ages ranged from 9 to 10 years old. Participant information is provided in Table 1. Univariate analysis of variance (ANOVA) indicated no statistically significant differences between the groups in relation to age $F(2, 211) = 0.129$, $p = 0.87$, $\eta 2 = 0.001$; and for gender, the Chi square test did not show statistically significant differences in the sample ($\chi 2 = 0.16$, $p = 0.91$).

Prior to the intervention, all students followed the regular curriculum of Spanish primary schools focusing on teaching different genres (narrative, expository) as well as teaching rules for correct spelling and grammar, without any strategy-focused instruction (see García, de Caso-Fuertes, Fidalgo-Redondo, Arias-Gundín, & Torrance, 2010). In relation to reading curriculum all participants had received similar forms of reading instruction based on the phonetic method (Alegría, Carrillo, & Sánchez, 2005).

Table 1 Descriptive characteristics of the participants for the three conditions

	N = 215	Gender (*n*)	Mean age (SD)	Total mean age (SD)

Brief-CSRI (experimental condition 2)	*n* = 69	Male (34)	9.51 (0.51)	9.50 (0.50)
		Female (35)	9.51 (0.51)	
Full-CSRI (experimental condition 1)	*n* = 72	Male (33)	9.51 (0.52)	9.51(0.53)
		Female (39)	9.50 (0.52)	
Control condition	*n* = 74	Male (35)	9.45 (0.52)	9.47 (0.51)
		Female (39)	9.47 (0.52)	

SD standard desviation

Instruments and measures

Writing assessment tasks

In the writing assessment task, students had to write a total of three (pre-intervention, post-intervention and maintenance) compare–contrast texts based on the similarities and differences between various topics that were selected beforehand based on students' interests (i.e., film versus book, traveling by car versus trave- ling by plane, traditional games versus computer games). The writing task topics were related to subjects covered in the students' 4th grade curriculum. To avoid the potential effect of specific topics on measurements, the topics were counterbalanced across assessment tasks in all evaluations. Compare–contrast text is relatively more difficult than other types of expository genres in which students have to generate categories and make comparisons within them in order to produce similarities and differences (MacArthur & Philippakos, 2010; Shen & Troia, 2018).

Evaluation Session

The evaluation session lasted 1 hour in which a specialist researcher gave the students small cards which included the title of the topic (e.g., "traveling by car versus traveling by plane") with a picture about the topic. Then students were asked to write a compare–contrast text. The specialist researcher pro- vided students with two work sheets, one for rough-work ("planning sheet") and one for the final text. Students were

told that they were free to use the first work sheet if they wished but that they did not have to use it. The specialist researcher reminded the students that they had 1 h to write their text (the usual duration of the students' Spanish language class) and encouraged them to produce the best essay that they could. The specialist researcher did not provide any help during the evaluation writing task.

Product Assessment.

Texts were evaluated holistically by two researchers using three measures, structure, coherence, and quality via the method described by Spencer and Fitzgerald (1993), used in several previous studies (e.g., López et al., 2019). First, two researchers had prior training with reader-based measures. Both independently rated a sample of 30 texts in three separate rounds, one round per variable. The mean inter-rater correlation (Pearson's r) was found to be high for each measure (structure = 0.91; coherence = 0.90; quality = 0.92). The Structure was assessed on a four-point scale, ranging from 1 = lack of any obvious structure to 4 = well structured. The evaluators were asked to identify whether the text presented a clear reference to introduction, development, and conclusion components. Coherence was also assessed on a four-point scale, with 1 = incoherent and 4 = entirely coherent. This score was based on whether it was possible to identify the main argument, whether the text presented clear progression of ideas without digressions and whether the text maintained local cohesion. Quality was assessed on a six-point scale, with 1 = not suitable, hard to understand and 6 = excellent. Scores were based on the extent to which the text included rich ideas, diverse and appropriate vocabulary, interesting detail, as well as taking into account correct sentence structure, punctuation, and spelling. After the prior training, the evaluators independently rated all of the texts. Again, the mean inter-rater correlation (Pearson's r) was found to be high for each measure (structure = 0.90; coherence = 0.91; quality = 0.91).

Instructional program

The strategy-focused instruction used was the CSRI program, which aims for students to achieve cognitive self-regulation by developing strategic knowledge about how to produce good compare–contrast texts. The full-CSRI (experimental condition 1) taught students both the features of good compare–contrast texts along with planning and drafting strategies. However, in brief-CSRI (experimental condition 2), students learned through a strategic approach to set appropriate product goals for the compare–contrast texts (ensure appropriate text structure, coherence, organization and style for

the reader) but without any explicit encouragement to plan their text. These two experimental conditions were compared with a practice-matched control group. The features of the three conditions are summarized below.

Experimental Condition 1: Full-CSRI. The first experimental condition included the three components (two sessions for each) in sequence in a total of six sessions: direct teaching, modelling and peer practice. The focus of this condition is to help student to achieve self-regulated planning procedures (self-reflections, self-instructions) focused on the product form and process goals.

The direct teaching component involved two sessions in which students were introduced to the strategy planning process (session 1) and then to the drafting process (session 2). At the beginning of session 1, the instructor taught a metacognitive matrix identifying the nature, purpose, and central features of effective planning processes. Then, students were introduced to the mnemonic POD + the vowels OAIUE, to scaffold planning their compare–contrast texts. POD stands for each of the steps:

(1) *Think of ideas*—Pensar—before writing; (2) *Organize* your thoughts with the OAIUE mnemonic rule [O (*Objective*) prompted students to identify the purpose of different text types; A (*Audience*) prompted students to capture future readers' interest and attention, motivate them to read, make it easier to understand, etc. I (*Ideas*) prompted students to think of ideas, brainstorm, or search for other documentary sources, and differentiate between main and secondary ideas and examples. U (*Union*) reminded students to connect the ideas in the text, joining thematic ideas (e.g., similarities vs. differences in compare–contrast texts); E (*Esquema-Plan*) reminded students to make a plan including ideas about the introduction, development and conclusion]; and (3) *Develop* the text. The strategy was supported by a chart showing the POD + vowels mnemonics. Moreover, to facilitate students learning about the OAIUE vowels, the knowledge was illustrated in a compare–contrast text. Similar to the first session, in the second session students were given a metacognitive matrix identifying the nature, purpose and central features of effective drafting processes. Then, the instructor taught the mnemonic IDC + the vowels OAIUE. IDC encourages the organization and structure of a compare–contrast text:

(1) *Introduction* in which students should present the topic, the purpose of the text and capture the readers' interest; (2) *Development* in which students were instructed to develop the ideas and examples to explain these ideas and; (3) *Conclusion*

which reminded students to make a personal contribution to the text, an overall point of view, or reflection of everything discussed in the text. Again, the vowels provide criteria about the content during all three of the IDC production phases.

In the modelling component the teacher demonstrated the correct writing process steps for the planning strategy (session 3) and drafting strategy (session 4). Model- ling involved Think aloud while composing a compare–contrast text in front of the class. Think aloud was mainly scripted. The teacher emphasized explicit references to the strategies with a self-regulatory approach to the task ("The first thing I am going to do is, as the letter E—Esquema—says, a Plan of my text… But first of all, it is important that everything in my plan is done thinking of the letter A-Audience"), and with self-statements about positive expectations ("If I make a last effort I will do it") producing a written plan (session 5) and draft text (session 6). The teacher explained to the students that during the modelling they had to concentrate on all the teacher's steps and thoughts during the writing process ("the first thing I have to do is plan my text") not on the ideas about the topic ("the similarity between cars and airplanes is that both are transport"). After modelling, students made notes about the model's most important thoughts. Then, the instructor facilitated a whole- class discussion drawing together the students' observations. At the end, each student individually wrote down reflections about the differences between their own writing practice and the processes that they had seen.

Finally, in the peer practice component students worked in pairs, emulating the planning (session 5) and drafting strategies (session 6) during writing. Session 5 started with the instructor reminding students about the mnemonic POD + the vowels. The instructor emphasized to the students that in order to emulate the planning process, they had to follow the modelling demonstrated by the teacher in the previous sessions. Consequently, the teacher reminded students that they had to use self-instructions with Think aloud to regulate what they were doing. For this purpose, students had a sheet with a list of self-instructions (created by the teacher during modelling). Once students had been reminded of the background information, the instructor selected students with similar abilities and paired them. Students were assigned to writer or helper roles. The more extrovert student or the one more likely to Think aloud was the writer, and the other was the helper. These roles were maintained throughout both sessions. During composition, Think aloud helped expose the writing processes adopted by the writer to

the helper's observation and comments. While the pairs were planning their texts (session 5), the students had in front of them a sheet with spaces for the their own notes in the margins laid out following the POD + vowels criteria (so students would not forget to do it) and the sheet with a list of self-instructions to facilitate Think aloud during planning. In the second session of this component (session 6), the writer took the outline created in the previous session and translated it into text. This session then followed an identical pattern to session 5, with a focus on the IDC mnemonic. In both sessions, during Think aloud composing, the instructor also patrolled the class, listening to the Think aloud and providing feedback and help for the writer about how to perform the thinking aloud and apply the strategies taught.

Experimental Condition 2: Brief-CSRI. The focus of this condition was to help students to achieve self-regulated planning procedures by focusing on the product form. As in the experimental condition 1, in initial sessions students were introduced to the OAIUE mnemonic in order to ensure good comparison–contrast texts, but without any direct reference to planning strategy. The concepts underlying the OAIUE mnemonic (objective, audience, content, coherence, and structure) were illustrated in different genres (descriptive, argumentative), and particularly, in com- pare–contrast texts. Sessions 3 and 4 followed the same sequence as experimental condition 1, that is, modelling followed reflection and class-discussion. However, in this experimental condition the teacher modeled an example of good (session 3) and incomplete (session 4) compare–contrast texts with only references to product goals structured around the OAIUE mnemonic. In the last sessions (5 and 6) students worked alone during the writing of an expository text (session 5) and compare–contrast text (session 6). During writing, as in experimental condition 1, the students emulated the Think aloud that they had seen the model use in the previous sessions.

*Control Condition***.** The control condition was production-focused without any strategy instruction (without teaching explicit strategies for process and setting product goals) but with the same level of practice as the experimental conditions. The instruction focused on structural and linguistic features of the compare–contrast text. The instructional program is described briefly below.

In session 1, the instructor focused on teaching different types of texts and their characteristics. The instructor started the first session with a brainstorm on the importance of quality writing. After that, the instructor taught the objectives of three

text types (argumentative, descriptive and compare–contrast text). Then, the instructor presented the students with two tasks in which they had to identify textual examples for each of the previously taught text types. In session 2 the instructor presented the structure and characteristics of each of the three types in detail. To make it easier for students to memorize content, the teacher gave the students different text types to identify and analyze the characteristics.

In sessions 3 and 4, students used different questions to analyze the specific characteristics of correct (session 3) and incomplete (session 4) examples of compare–contrast texts. Students individually practiced writing an expository text (not necessarily a compare–contrast text) in session 5, and specifically a compare–contrast text in session 6. After finishing the task, students read the texts in the class- group and the instructor and the class were able to provide feedback on whether the text had the required characteristics of a compare–contrast text.

Procedure

Training delivery

The study was conducted during the spring school term. Table 2 presents a timetable of study procedures. The sessions took place in literacy lessons. The full implementation of the program was carried out by 9 teachers (educational professionals with master's degrees in Primary Education) one for each class. Classes were composed of 20–25 students. Each instructor taught the full 6 sessions of the program. All sessions lasted for approximately 60 min in all conditions. Training teachers was a principal element through which we ensured the program was carried out by establishing what the teachers had to do and how they had to do it. Previous research has demonstrated the positive relationship between training teachers and students' writing performance (e.g., De Smedt, Van Keer, & Merchie, 2016).

Teacher preparation

Prior to the start of the intervention, a member of the research team (Ph.D. student specialist in Educational Psychology and writing instructional researcher) who guided the study methodology presented the CSRI program to the teachers (background, implementation schedule). Then, in order to facilitate the implementation of the CSRI program, all the teachers were given the complete set of materials for each student (individual portfolios) and a "teacher session manual" containing detailed descriptions

of the 6 sessions. The manual contained: (a) Instructions for how to start, carry out, and finish each session; (b) The specific materials to be used for each step of the session and how to address the students; (c) Instructions about how to talk to the students and activities for them.

The researcher asked teachers to read the session information carefully before the start of training to discuss and clarify any questions during the training sessions. There was a total of three training sessions (one for the direct teaching component, another for modelling and a final session for the peer practice component). Each training session was delivered a week before it was implemented. All sessions lasted for approximately 60 min following the same two-part pattern. In the first part of the session, the researcher started with an explanation of the specific component and its goal. In the second part of the session the researcher explained and discussed the steps described in the teacher's portfolio. Specifically, in the modelling training session, an example of Think aloud was provided for use in the instructional session and was trained during the session. In this second part of the session, teachers were able to ask questions and resolve any issues they may have had about implementing the sessions.

Table 2 Timeline of study procedures

Date	Activities
February 5-March 15	School principals were contacted to obtain their participation in the study
March 19 - 23	Consent forms to participate in research were collected from parents
March 26 to April 5	Teachers were provided with materials describing the CSRI program
April 16-20	Pre-test evaluation
April 17	First training with teachers in their classrooms: POD strategy and/or vowels mnemonic
April 25-26	Session 1 of CSRI
May 2-3	Session 2 of CSRI

May 7	Second training with teachers in their classrooms: Modelling of POD strategy and/or vowels mnemonic
May 8-9	Session 3 of CSRI
May 15-16	Session 4 of CSRI
May 21	Third training with teachers in their classrooms: peer practice
May 22-23	Session 5 of CSRI
May 29-30	Session 6 of CSRI
June 4-8	Post-test Evaluation
January 21-23	Maintenance Evaluation

Treatment fidelity

We used the following measures to ensure that the teachers implemented the program in the right way. First, all teachers were given manuals including the elements and activities for each session. Second, a specialist researcher met with the teachers weekly to train them in applying the instructional procedures. Third, the student portfolios with the set of materials were reviewed following the sessions, allowing us to check whether the students had correctly completed the tasks. Evidence from student portfolios suggested that training was delivered correctly. Fourth, intervention, evaluation and teacher preparation sessions were recorded in audio. The first author listened to the intervention session recordings and noted whether each step or procedure was completed. The fidelity for the three teachers of the full-CSRI group (experimental condition 1) averaged 96.8% (*SD* = 0.18, range 80–100), 97.1% (*SD* = 0.16, range 80–100) and 97.6% (*SD* = 0.19, range 80–100) respectively. For the three teachers of the brief-CSRI group (experimental condition 2) the mean was 97.6% (*SD* = 0.19, range 80–100), 90.3% (S*D* = 1.16, range 80–100) and 97% (*SD* = 0.24, range 80–100) respectively.

Data analysis

The data was analyzed using the SPSS 24.0 program (IBM, Chicago, IL, USA). Nested data structures suggest HLM analysis. However, this data analysis strategy is appropriate only when certain conditions are met (Gelman & Hill, 2006; Goldstein,

2003). One of those requirements is the sample size regarding each of the levels of the hierarchical structure (Maas & Hox, 2005). These authors indicated that at least 50 classes constitute a sufficient sample size for accurate estimation. Since there were only nine classes in the present study, the effect of nesting was not taken into account in the analyses. Consequently, we used Analysis of Covariance (ANCOVA) to evaluate the effects of the intervention at post-test and maintenance timepoints. The dependent variables were the three measures (structure, coherence, and quality), the independent variable was treatment condition (full-CSRI, brief-CSRI, and control). The covariate in the post-test analysis was students' pre-test performance; and at maintenance the covariate was the post-test performance. Comparisons to check for specific differences between the three conditions were carried out by means of post hoc tests. We used Cohen's (1988) criteria to interpret effect size, which states that the effect is small when $\eta_p^2 = 0.01$ ($d = 0.20$), medium when $\eta_p^2 = 0.059$ ($d = 0.50$), and large when $\eta_p^2 = 0.138$ ($d = 0.80$).

Results

Preliminary results

Table 3 shows bivariate correlations between the reader-based measures at pre-test, post-test, and maintenance. Correlations between the three reader-based variables (Pearson's r = < 1) suggest good discriminant validity in the context of this study. Given that the asymmetry and kurtosis values of the variables (structure, coherence, and quality) were within the intervals that denote a normal distribution (Kline, 2011), we used a parametric analysis. We also analyzed differences in pre-test measures regarding condition. The results indicated that the differences were statistically significant for the condition in relation to quality $F(2, 212) = 6.716$, $p = 0.001$, $\eta_p^2 = 0.06$ but not significant for structure ($p = 0.648$) or coherence ($p = 0.508$). Table 4 summarizes the means and standard deviations for each variable (structure, coherence, and quality) by condition, in the pre-test, post-test and maintenance assessments (Fig. 1).

Table 3 Bivariate correlations, skewness, and kurtosis among reader-based measures at pre-test, post-test, and maintenance

	1	2	3	4	5	6	7	8	9

1		0.388**	0.676**	0.364**	0.417**	0.315**	0.105	0.110	0.201*
2			0.309**	0.688**	0.247**	0.651**	0.099	0.176	0.142
3				0.381**	0.365**	0.345**	0.028	0.091	0.175
4					0.175*	0.646**	0.128	0.215*	0.274**
5						0.258**	–0.027	–0.168	–0.029
6							0.155	0.127	0.143
7								0.633**	0.340**
8									0.371**
Sk	0.71	0.05	0.62	–0.14	–0.08	–0.20	–0.00	0.63	–0.05
K	–0.45	–0.67	–0.54	–0.86	–0.37	–0.41	–0.08	0.25	1.41

1, pre-test structure; 2, post-test structure; 3, pre-test coherence; 4, post-test coherence; 5, pre-test quality; 6, post-test quality; 7, maintenance structure; 8, maintenance quality; 9, maintenance coherence; Sk, skewness; K, kurtosis

*$p \leq 0.05$; **$p \leq 0.01$

Compare–contrast text results

Post-test results

For the structure variable, after controlling for differences in pre-test performance, ANCOVA showed that the condition was not significant in the post-test measure $F(2, 211) = 2.392$, $p = 0.094$, $\eta_p^2 = 0.02$.

For the coherence variable, after controlling for initial differences in pre-test performance, the ANCOVA showed that the condition was significant in the post-test measure $F(2, 211) = 9.222$, $p \leq 0.001$, $\eta_p^2 = 0.08$. Post hoc analysis showed statistically significant differences between the full-CSRI group (experimental condition 1) and the control group ($p \leq 0.001$), and also between the brief-CSRI group (experimental condition 2) and the control group ($p = 0.019$). We found no differences between the full-CSRI (experimental condition 1) and the brief-CSRI (experimental condition 2) groups ($p = 0.727$).

Finally, for the quality variable, the ANCOVA showed that the condition was significant in the post-test measure $F(2, 211) = 7.061$, $p = 0.001$, $\eta_p^2 = 0.06$. Post hoc analysis showed statistically significant differences between the full-CSRI group (experimental condition 1) and the control group ($p = 0.011$). We found no differ- ences between the brief-CSRI and the control groups ($p = 0.98$), or between the full- CSRI (experimental condition 1) and brief-CSRI (experimental condition 2) groups ($p = 0.11$).

Maintenance results

For the structure variable, after controlling post-test differences, the ANCOVA showed that the condition was significant in the maintenance measure $F(2, 99) = 8.606$, $p \leq 0.001$, $\eta_p^2 = 0.14$. Post hoc analysis showed statistically significant differences between the full-CSRI (experimental condition 1) and control groups ($p \leq 0.001$), and also between the brief-CSRI and control groups ($p = 0.030$). We found no differences between the full-CSRI (experimental condition 1) and brief-CSRI (experimental condition 2) groups ($p = 0.980$).

For the coherence variable, after controlling for post-test differences, the ANCOVA showed that the condition was not significant in the maintenance measure $F(2, 99) = 2.302$, $p = 0.10$, $\eta_p^2 = 0.04$.

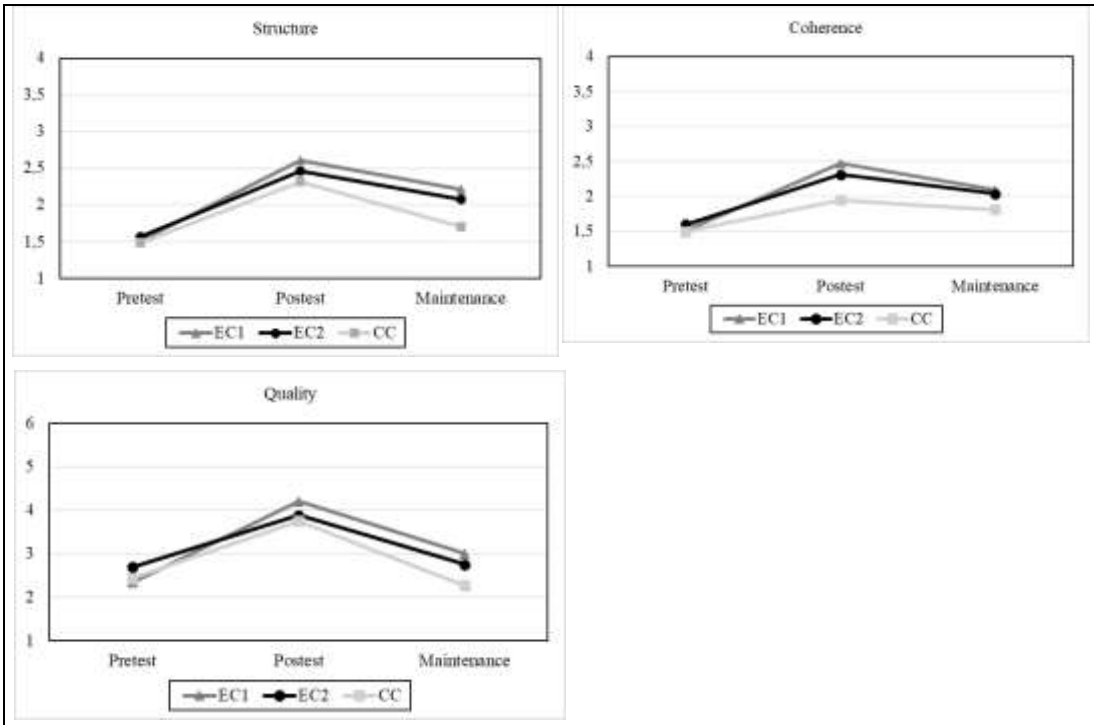
Finally, for the quality variable, after controlling post-test differences, the ANCOVA showed that the condition was significant in the maintenance measure $F(2, 99) = 9.288$, $p \leq 0.001$, $\eta_p^2 = 0.15$. Post hoc analysis showed statistically significant differences between the full-CSRI (experimental condition 1) and control groups ($p \leq 0.001$), and also between the brief-CSRI and control groups ($p = 0.031$). We found no differences between the full-CSRI (experimental condition 1) and brief-CSRI (experimental condition 2) groups ($p = 0.53$).

Table 4 Means and standard deviations for coherence, structure, and quality by condition

	EC1			EC2			Control		
	Pre	Post	Maintenance	Pre	Post	Maintenance	Pre	Post	Maintenance
	N = 72		*N* = 42	*N* = 69		*N* = 24	*N* = 74		*N* = 37
	M (SD)	M(SD)	M (SD)	M (SD)	M(SD)	M (SD)	M (SD)	M(SD)	M (SD)
Coherence	1.51 (0.58)	2.47 (0.73)	2.09 (0.53)	1.60 (0.66)	2.31 (0.84)	2.04 (0.35)	1.50 (0.55)	1.95 (0.74)	1.81 (0.46)
Structure	1.51 (0.67)	2.61 (0.81)	2.21 (0.64)	1.57 (0.60)	2.46 (0.86)	2.08 (0.40)	1.48 (0.55)	2.31 (0.90)	1.70 (0.51)
Quality	2.34 (0.65)	4.20 (0.83)	3.00 (0.88)	2.69 (0.49)	3.88 (1.07)	2.75 (0.53)	2.43 (0.59)	3.75 (0.85)	2.27 (0.60)

EC1, experimental condition 1 (full-CSRI); EC2, experimental condition 2 (brief-CSRI); control, control condition. Attrition rates of 41.6% were observed for EC1 ($n = 30$), 65.2% for EC2 ($n = 45$) and 50% for control ($n = 37$) at maintenance test.

Figure 1 Evolution in the Performance in Each Variable by Condition



EC1 = Experimental condition 1(full-CSRI); EC2 = Experimental condition 2 (brief-CSRI); CC = Control condition.

Discussion

To achieve self-regulating behavior during writing, teaching planning procedures is considered essential (Kellogg, 2018). However, how much, and what types of planning procedures are valuable varies across students' ages and textual genres (Galbraith, 2009; MacArthur, 2017). This study explores for the first time the short- and long-term effects of two forms of CSRI strategy-focused instruc- tion on 4th grade students' writing skills. Full-CSRI (experimental condition 1) taught students strategies for pre-planning and drafting a compare–contrast text. In contrast, in the brief-CSRI group (experimental condition 2), students learned a strategic approach to set product goals, but their instruction did not include any mention of the planning procedure. After 6 sessions of training the results suggested that only the full-CSRI group produced texts that were assessed as being more coherent and of higher quality, but no better structured, than the control condition. Nevertheless, before a firm conclusion can be drawn about

the benefits of strategy-focused instruction in a short-term period, the results need to be explained in more detail.

In relation to the structure measure, contrary to our predictions, the results suggested that students made good progress under the three conditions between pre-test and post-test with no differences between them. One reason for this lack of difference compared to the control condition is that some students' writing performance was affected by their domain of structure knowledge (Hammann & Stevens, 2003; Murphy & Alexander, 2002). In this regard, students are familiar with the concept of textual structure because in Spanish primary schools writing instruction is typically focused on learning the structure of texts. Moreover, is part of students' cultural baggage to have read narratives with an introduction, development, and a conclusion. If students think that they already know about the concept of text structure, they may not perceive the utility of using the strategies.

Unlike structure, coherence and quality are constructs that are rarely taught explicitly in the process of learning to write (e.g., García et al., 2010). Moreover, achieving high coherence and quality in a compare–contrast text is a challenge for young students given the organizational demands of this type of text (Englert & Hiebert, 1984; Shen & Troia, 2018). Therefore, planning procedures become indispensable for the student, because planning intrinsically involves reasoning about content (about the internal set of relationships of ideas and their consistency, about how to develop an idea to capture interest and so forth) (e.g., Hayes, 2012; Torrance, 2015). In this regard, our results showed that after the end of the intervention, the students from both experimental conditions wrote more coherent texts and only the group who had full-CSRI instruction produced higher quality texts than the control condition.

On the other hand, in relation to the question about what experimental conditions are more beneficial compared to the control, the results showed that, consistent with previous findings (e.g., Kiuhara et al., 2012; Palermo & Thomson, 2018; Saddler, Moran, Graham, & Harris, 2004; Shen & Troia, 2018), teaching explicit planning procedures, such as advance planning in tandem with genre knowledge results in more competent writers. The full-CSRI condition not only had significant improvements, but these improvements were produced in both measures, coherence, and quality.

Moreover, as the literature suggested, planning in advance functioned as a

support or external memory (Graham et al., 2005) that helped students to simplify the process of thinking about content during the composition and reduced the cognitive overload (Kellogg, 2008). In this study, this could explain why the results from the brief-CSRI group were lower and even why the quality of their texts was similar to the control condition. Textual quality involves, but is not limited to structure and coherence, it also involves taking into account the complexity and richness of ideas, interesting detail, and correct usage of mechanics, it is, in short, the overall merit of the text. Certainly, we taught a strategic approach (the vowels mnemonic) to help brief-CSRI students achieve those product goals. However, unlike the full-CSRI students, we left them to work these considerations into their own writing processes. This alternative probably caused cognitive overload during writing. In other words, because in the brief-CSRI condition students were not taught, and did not subsequently adopt, explicit pre-planning processes, students attempted to pursue product goals to achieve quality text while also struggling with translating their thoughts into words.

Seven months after the end of the intervention, as we predicted, the CSRI students (full-CSRI and brief-CSRI) wrote better compare–contrast texts (reflected in greater structure and quality of the text product) than the students in the control condition. Again, the results showed that the full-CSRI students wrote significantly better than the brief-CSRI group. This is consistent with the few studies which have evaluated the maintenance effects of strategy-focused instruction in elementary grades (e.g., Fidalgo et al., 2008; Glaser & Brunstein, 2007; Tracy et al., 2009). In these studies, the authors found that students who had received strategy-focused instruction (in planning, drafting and revising processes) wrote better compositions compared to the control 2 weeks after the instruction (Tracy et al., 2009), 5 weeks after the instruction (Glaser & Brunstein, 2007), and even 28 months after the intervention finished (Fidalgo et al., 2008). Of course, there was, on average, a decrease in the three variables between post-test and the maintenance timepoints for all three conditions. However, the CSRI students did not fall back to their pretreatment levels and their means were above the control group. This result suggests the possibility that CSRI training might benefit from booster sessions and/or from increasing the length of the initial treatment to ensure greater maintenance effects.

Finally, we compared our effect size with those of previous studies with elementary grades (Graham & Perin, 2007; Koster et al., 2015) and CSRI studies (e.g.,

Torrance et al., 2015). We found that the effect sizes in our study on the three measures (coherence, structure, and quality) were much smaller than the large effects found in those previous evaluations of instructional strategies. The most reasonable explanation is the combination of the nature of the sample, given that students were younger than those in previous studies with CSRI programs, and the novel instructional content. Learning with the CSRI program was a challenge for the 4th grade students because they had to learn different strategies in a single, short session each week. It was also a challenge for the teachers, who have never used instructional methods such as modelling or peer practice to teach writing before.

In summary, these findings, although limited, add to our understanding of the mechanisms underlying the effects of CSRI strategy-focused instruction. More specifically teaching process strategies, particularly pre-planning in fourth grade students, is more beneficial than traditional instruction over short and long-term periods.

Limitations and future directions

Caution must be applied when interpreting the intervention effects because there was significant sample mortality and a reduction in participants between the intervention and the maintenance evaluation. Clearly, further research is needed to replicate this study using a larger sample and more homogeneous groups (i.e., different school contexts with different students, for example, students with learning difficulties). Moreover, more research is needed using online measures which allow us to ascertain the distribution of processes during composition and the contribution of different aspects to text quality (López et al., 2019). Finally, we suggest that in order to verify whether students are benefiting from developing their planning skills in a more valid and reliable way, it would be helpful to test whether student performance gains transfer to genres that are not the focus of the instruction (Torrance, 2015). In addition, we also suggest that future research explore in more detail the learning of the brief-CSRI condition. This condition may have resulted in implicit goal setting and goal setting can lead to planning.

Educational implications

It is important to note that through the CSRI program teachers and students are placed in a supportive writing environment with the message that writing needs to be taught and shown effectively to be learned, and it should not be understood as a

complementary task that is learned automatically. In this study we explored three instructional interventions that may help educators to make decisions based on the evidence. Thus, we hope that educators contextualize this knowledge in order to accordingly develop and design the best writing instruction possible in their classes.

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CHAPTER 6: DIFFERENT TECHNOLOGIES IN THE CONTEXT OF WRITING INSTRUCTION

This chapter faithfully reflects the content of: Rodríguez-Málaga, L., Rodríguez, C, & Fidalgo, R (2020). Different technologies in the context of writing instruction. In R. V. Nata (Ed). *Progress in Education* (Vol. 63, pp. 105-133). Nova Science Publishers.

Introduction

In the last decades, different theoretical and empirical questions have been posed about which are the cognitive processes involved in writing (Bereiter & Scardamalia, 1987; Hayes & Flower 1980); why some students do not have problems to deploy their writing skills, while for others, it entails a whole challenge (Swanson, Graham, & Harris, 2013); or what instructional practices can be effective (Graham, Harris & Cahmbers, 2016). In relation to the latter, recent meta-analysis shows how the use of the word processor is an effective practice determined with a moderate effect size, both at the level of Primary Education, as well as Secondary Education (Graham & Perin, 2007; Graham et al., 2012). Similar to the word processor, other software such as spell checkers, word prediction software and speech recognition, have also proven to be very effective in students with learning disabilities (Macarthur, 2009; Peterson-karlan, 2011). Although these tools also have some advantages in relation to handwriting, little relation have with instruction in higher processes, such as planning, metacognition, or revision (Bangert-Drowns, 1993; Kozma, 1991, Macarthur, 2006). The research points out the fundamental role played by the deployment of these processes in the acquisition of writing and how, apprentices of all ages, have problems to develop these skills (MacArthur, Graham & Fitzgerald, 2008). Technological advances have attempted to give an answer to this problem, through the development of tools that incorporate scaffolding or conceptual guides, metacognitive, procedures or strategies that facilitate students an "action plan" and reduce the cognitive load (Azevedo & Hadwin, 2005; Baker & Scanlon, 2002; Bereiter & Scardamalia, 1986).

Another key aspect of the research is the use of computer programs specialized in textual evaluation, such as the AES (Automated Essay Scoring) and AWE (Automated Writing Evaluation) systems (Shermis, Raymat & Barrera, 2003). Integrated in virtual learning environments, they bestow a continuous frame of practice in the reiterative cycles of the review and evaluation. This allows to expand the work of the teacher and offer greater availability to focus on other types of instructional objectives (Macarthur, 2006; Shermis et al., 2017). Criterion's e-rater®, MY Access! ™! or Project Essay Grade (PEG) are examples of systems that are based on a combination of feedback and punctuation, but not on quality (Warschauer & Ware, 2006).

The concept of technology includes, although is not limited to the aforementioned set of tools. The use of Internet in the last few years and Web 2.0 by students and teachers bestow new learning-teaching environments and new procedures to compose, which are based on hypermedia (MacArthur & Karchmer-Klein, 2010; Purdy, 2010). The web 2.0 is referred to a wide number of spaces (social webs, blogs, wikis, e-learning platforms, etc.) which are based on the community principle that collaborates in the production of contents. It is precisely the very concept of collaboration the best way to understand instruction in writing through the Web 2.0 (Karchmer-Klein, 2013). In general, we understand collaborative writing as "an iterative and social process that involves a team focused on a common goal that negotiates, coordinates and communicates during the creation of a common document" (Lowry, Curtis & Lowry, 2004, p.72). This common document is called electronic text and is the mean of communication through the internet (Karchmer-Klein, 2013). The connectivity, main feature of the electronic text, renders it a non-linear text, whose morphology is represented by the combination of inter- and intra-documentary links between the information nodes (Lamarca, 2006). In this interactive dynamic, the active role of students during their composition becomes more important than ever. This is because they have to think about the needs of different audiences, who can choose which fragments or information nodes they want to read or, on the contrary, follow the textual path of the writer (Karchmer-Klein, 2013).

Based on the above, there is no doubt concerning the increasing interest of researchers and educators in the use of ICT and the relationship between technology and performance in writing. Therefore, it is necessary to analyze the published research in order to offer updated data, which also provides for possible implications in educational practice. In the following lines, we describe some of the research carried out in different educational stages and with different purposes.

Method

Search and Selection Process

The systematic search included the analysis of the works was published in the period from 2000 to the present. The starting date was 2000, coinciding with the boom of ICT (Information and Communication Technology) in the field of writing (Peterson-Karlan, 2011). The following databases were used: Web of Science and ScienceDirect, using the following keywords: writing, writing instruction, intelligent tutoring systems,

technology, virtual learning environments; Additionally, we examined meta-analyses: “Meta-Analysis of Writing Instruction for Adolescent Students” (Graham & Perin, 2007); “Meta-Analysis of Writing Instruction for Students in the Elementary Grades” (Graham, McKeown, Kiuhara & Harris, 2012); “Teaching Children to Write: A Meta-Analysis of Writing Intervention Research” (Koster, Tribushinina, Jong & Bergh, 2015); “Meta-analysis of single subject design writing intervention research” (Rogers & Graham, 2008); “Meta-analysis of writing interventions for students with learning disabilities” (Gillespie & Graham, 2014).

Table 1. Synthesis of the articles included in the review according to the inclusion criteria

Authors	Aim	Design	N Sample	Type of Sample	Tool/System	Evaluated Variables	Results
MacArthur and Cavalier, (2004)	To compare dictation recognition, through a Scribe and handwriting	Quasi-experimental	31	Secondary Education with/without LD	Speech recognition	Quality Wrong words Length Vocabulary Planning, Writing and revision times	Significant differences between method No Significant differences between method
Quinlan (2004)	To examine the speech recognition software	Quasi-experimental with control group	41	With / without LD	Speech recognition	Productivity Superficial errors Quality Writing time Nº of planning Words	Significant differences for LD condition No Significant differences for LD condition
Handley-More et al. (2003)	To investigate whether the use of word processing,	Case study alternative treatment	3	Primary Education with LD	word processor (only/with	Legibility Spelling	Significant differences between method

Table 1. Synthesis of the articles included in the review according to the inclusion criteria

Authors	Aim	Design	N Sample	Type of Sample	Tool/System	Evaluated Variables	Results
	either alone or with word prediction, was effective in improving the written communication skills				prediction of words)	Writing rate Total number of words	No significant differences between method
Lowther, Ross and Morrison (2003)	Examined the educational effects of word processor	Quasi-experimental with control group	118	Primary and middle Education	Word processor	Content Organization Style Grammar	Significant differences between groups
Barrera III, Rule and Diemart (2001)	To compare the word processor and handwriting	Quasi-experimental with alternative treatment and three groups: high achievers, average achievers, and low achievers).	18	Primary Education	Word processor	Productivity Writing time	Significant differences between method No Significant differences between method

Table 1. Synthesis of the articles included in the review according to the inclusion criteria

Authors	Aim	Design	N Sample	Type of Sample	Tool/System	Evaluated Variables	Results
Englert, Wu, and Zhao (2005)	To analyze the effect of a Web environment	Case studies with 3 conditions (Tele-Web Supported Unsupported and Paper & Pencil)	12	Primary Education with LD	Sofware "Tele-Web"	Titles; Related detail; Organization Productivity	Significant differences between conditions No significant differences
De Smet et al. (2012)	To evaluate the repeated effect of the electronic scheme.	Quasi-experimental without control group	58	Secondary Education	Electronic scheme	Mental effort; Structure; Presentation Total Text Structure and Hierarchical Elaboration of Arguments	Repeated use positively affected Structure Presentation and led to decreased perceived mental effort. No significant effect was found
Zaid (2011)	To evaluate the effect of the concept	Quasi-experimental	108	English learners	Electronic conceptual map	Textual quality	Significant differences between

Table 1. Synthesis of the articles included in the review according to the inclusion criteria

Authors	Aim	Design	N Sample	Type of Sample	Tool/System	Evaluated Variables	Results
	map and online reading.	with control group					groups
Li, Link and Hegelheimer (2015)	To explore the role of an AWE system.	Quasi-experimental without control group	70	English learners	AWE system, "Criterion"	Nº of errors (grammar, usage, mechanics and style) from the first draft to the final draft	The average error rates on the final draft was significantly lower than the first draft
Crinon and Legros (2002)	To evaluate the effect of consulting a database in the review and rewriting process.	Quasi-experimental with control group	54	Primary Education	Sofware "Scripertexte"	Nº and type of proposals produced	Significant differences between groups
Heift and Rimrott (2008)	To investigate the effect of three types of feedback on the correction	Quasi-experimental without control	28	English learners of German	ITS "E-Tutor"	Spelling errors	The most explicit feedback achieved the

Table 1. Synthesis of the articles included in the review according to the inclusion criteria

Authors	Aim	Design	N Sample	Type of Sample	Tool/System	Evaluated Variables	Results
	of spelling errors						most correct answers.
Rowley and Meyer, (2003)	To test the effectiveness of ITS to improve writing performance.	Quasi-experimental with control group	471	Primary and Secondary Education	ITS "Maestro"	Structure Coherence vocabulary Grammar	No significant differences between the experimental group and the control.
Roscoe and McNamara, (2013).	To evaluate the effectiveness of ITS	Quasi-experimental without control group	141	Secondary Education	ITS "W-Pal"	Length Structure Cohesion Lexicon	Significant differences pre/post
Proske, Narciss and McNamara, (2012).	To analyze the effect of an-ITS in the writing of scientific texts	Quasi-experimental with control group	42	Higher education	ITS "Escribo"	Textual quality Productivity Time in the task	Significant differences between the groups. No significant differences.
Holdich and Chung (2003)	To test the hypothesis that an-ITS can change the way	Case studies with control group.	5	Primary Education	ITS "Harry"	Vocabulary Punctuation (full stops and comma use)	Significant differences between experimental

Table 1. Synthesis of the articles included in the review according to the inclusion criteria

Authors	Aim	Design	N Sample	Type of Sample	Tool/System	Evaluated Variables	Results
	children approach the task of writing and improve their performance.					Productivity Syntax	students and control
Sung et al. (2016)	To improve summary skills	Quasi-experimental without control group.	154	Primary Education	ITS based on latent semantic analysis	Productivity Content Nº of revisions	Significant differences between the experimental groups (with / without semantic and concept feedback)
Franzke et al. (2005)	To offer a supportive context for students to practice summary writing skill	Quasi-experimental with control group	121	Secondary Education	ITS "Summary Street"	Quality Organization Mechanics Style	Significant differences between the experimental group and control group

Table 1. Synthesis of the articles included in the review according to the inclusion criteria

Authors	Aim	Design	N Sample	Type of Sample	Tool/System	Evaluated Variables	Results
Wichmann and Rummel (2013)	To examine the effect of collaboration scripts on a Wiki	Quasi-experimental with a control group	73	English Learners	Wiki	Nº of revisions Textual quality	Significant differences between the groups.
Arslan and Şahin-Kızıl (2010)	To analyze if the use of blog improves the writing performance	Quasi-experimental with control group	50	Higher Education	Blog	Content Organization vocabulary Mechanics	Significant differences between the groups.
Nicolaidou (2013)	To examine the effect of an e-portfolio on the textual product	Case study (pre / posttest)	20	Primary Education	Electronic portfolio	Textual quality Nº and type of feedback	Significant differences pre/post

Note. LD=Learning Disabilities; AEE= Automated Essay Evaluation; AWE=Automated Writing Evaluation; ITS=Intelligent Tutor System

Inclusion and Exclusion Criteria

Along the line with the objectives of this study, the following inclusion criteria were taken into account: (a) be a study whose main objective was the analysis of the effect of the tool on the written product and / or on the cognitive processes involved in the writing, that is, planning, transcription and revision (Hayes & Flower, 1980); (b) be an experimental, quasi-experimental or single-case study; (c) the study should include a measure of the quality of the written product and / or improvement in cognitive processes; (c) studies of Primary, Secondary or Higher Education were selected. As exclusion criteria, the following measures were adopted: (a) those studies whose interventions took place in a sample of students with special educational needs were discarded; b) book chapters or unpublished works.

Coding Data

The content of each article was codified in a database that included the following fields: a) authors; b) objective; c) design; d) sample; e) tool/system; f) evaluated variables; and g) results obtained. Table 1 shows studies selected.

Results

The search process resulted in 257 references whose titles and abstracts were examined. Considering the inclusion criteria, 91,8% were excluded, obtaining a total of 21 empirical studies. Figure 1 shows the flow chart that represents the procedure followed in the bibliographic search. According to the purpose of the system, the description of the studies is detailed below: a) technology designed to instruct in a specific writing process (planning, transcription, and reviewing process) (n=11); b) technology designed to instruct in the entire writing process: Intelligent Tutor Systems (n=7). c) new forms of writing: Web 2.0 (n = 3).

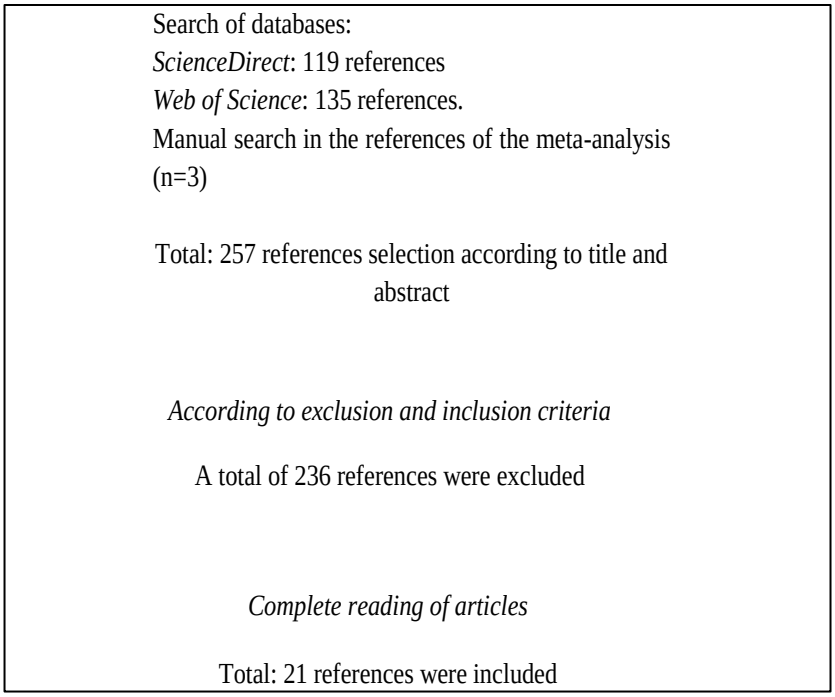

Figure 1. Process of selection of the sample of articles to analyze.

Technology Designed to Instruct in a Specific Writing Process

Transcription Process

Technology has undoubtedly entailed a support to students with learning difficulties and their disabilities with the mechanics of writing (Graham & Harris, 2003, Macarthur 1996). In their study, MacArthur, and Cavalier (2004) compared three different methodologies in Secondary Education students: dictation with speech recognition, handwriting, and dictation to a scribe. The texts dictated with speech recognition were of higher quality than handwritten essays (ES = 0.42) and the essays dictated to a scribe were even better (ES = 1.31). While it is true that the review time was shorter when the students wrote by hand ($p < .001$), the authors pointed out that, in general, little time was spent in reviewing under any method. Quinlan (2004) examined voice recognition software along with planning instruction. Two groups of students between 11 and 14 years old were assigned to four writing conditions, which included two levels of transcription (speech recognition and handwriting) and two levels of planning (with and without planning instruction). It was the combination of speech recognition plus planning that produced the longest texts and with the least number of errors. In Primary Education, Handley-More, Deitz, Billingsley and Coggins (2003) used three methods of composition: (a) handwriting; (b) word processing and, (c) word processing with

prediction of words. The use of word processing, along with the prediction of words helped to improve the textual quality and in reducing the number of spelling errors.

Not only students with learning disabilities can benefit from additional support to produce text. In the study of Barrera III, Rule and Diemart (2001), 18 primary students without disabilities, alternately used the word processor and handwriting to produce texts during the school year. The authors demonstrated that the use of the word processor increased productivity, although it did not increase the time spent on the task. Similarly, Lowther, Ross and Morrison (2003) divided 118 sixth and seventh grade students into two groups, with and without a computer (n = 29; n = 30). The authors found significant differences in favor of the experimental group, for each of the 5 evaluated dimensions: ideas and content; organization, style, and mechanics. The size effects ranged from 0.53 to +1.47 in 6th grade and from +0.59 to +0.94 in 7th grade.

Helping students with writing also requires paying attention to the textual structure. Englert, Wu and Zhao (2005) used TeleWeb, a software to stimulate student's attention to the organization and structure of the text. In this study, 12 primary students wrote 3 personal news. All students went through 3 conditions: (a) handwriting; (b) TeleWeb; and (c) TeleWeb without scaffolding (similar to a word processor). The authors found that the texts written in the TeleWeb condition were of higher quality, more detailed and better organized, compared to the other two conditions.

Planning Process

As they affirm (Flower et al., 1992) "planning in writing is a strategic response both to the writing situation and to the writer's own knowledge" (p.181). Nevertheless, the role of the planning process is often non-existent or insufficient, especially in novice or difficult writers (Bereiter & Scardamalia, 1987, De La Paz & Graham, 1997; Saddler, Moran, Graham & Harris, 2004). Conceptual maps and electronic schemes are two of the most frequent tools to stimulate planning (MacArthur, 2006). In the study by De Smet, Brand-Gruwel, Broekkamp and Kirschner (2012), the repeated effect of the electronic scheme on 58 Secondary students was examined. The students were assigned to two experimental conditions: a) with instruction in the use of the electronic scheme before the first writing task and, b) with instruction before the second writing task. Not only the use of the electronic scheme improved the argumentative structure of the texts, but also caused a decrease in the perceived mental effort.

In the context of L2, Zaid (2011) explored the effects of the electronic conceptual map on the quality of writing of 108 English learners. The students were assigned to: Group A (experimental group 1, instructed in multimedia-based concept-mapping-only), Group B (experimental group 2, instructed in online reading before writing - only) and Group C, functioned as control group, which was instructed in a traditional, teacher talk, product-based method of writing instruction. All classes wrote a text (pretest) before each assessment and were asked to write about the same topic after the intervention. The instruction in the concept map was the most effective treatment.

Reviewing Process

The textual revision requires stimuli for textual evaluation and opportunities to apply the received feedback (Rijlaarsdam, Couzijn & Van Den Bergh, 2004). The development of language processing technologies such as AWE or AEE systems helps students in the revision process. Li, Link and Hegelheimer (2015) explored the role of an AWE system, Criterion, in 70 English learners. The Criterion software highlights errors and provides corrective feedback for 35 subcategories of the language, grouped into 4 main categories: grammar, use of language, mechanical aspects and style. The authors found that: (a) the number of revisions and written practice was increased; (b) The comparison between the first draft and the final draft showed a significant improvement in accuracy by reducing the error rates for the four text types. Wilson & Czik (2016), assigned 145 Higher Education students to two conditions: teacher feedback through Google Docs (n = 73) and combined feedback (n = 72): feedback from the teacher and from an AEE system, called Project Essay Grade (PEG). PEGWriting® is based on the analysis of a set of features of the textual product for each of which it emits a total score. The results of the study showed no significant differences in the textual quality between the conditions. The review of the comments revealed that the teachers provided a greater amount of feedback related to higher order processes (ideas, elaboration and organization) in the combined condition. An explanation in this regard was that the PEG system addressed to the evaluation of mechanical aspects quickly and efficiently. This saved time for the teacher to provide feedback on the macro-structural aspects.

Another approach to stimulate the revision process is by means of the use of databases that provide linguistic knowledge (MacArthur, 2006). Starting from this approach, Crinon and Legros (2002) used the Scripertexte tool in a sample of 54 students of Primary Education. Scripertexte is a tool designed to rewrite. It has two modules: a

text editor and an anthology of literature extracts for young people. The database contains approximately 250 extracts of stories and novels chosen for the quality of their writing. The students were asked to write 8 texts and then modify the first version by reading the Scripertexte models. The participants were divided into three groups: Scripertexte (condition 1); paper format (condition 2); and control group (who did not receive model texts). The pre/posttest analysis of the textual product showed that the use of Scripertexte helped produce more original macro-structural propositions during rewriting, rather than literal copies of the model texts.

Technology to Instruct in the Entire Writing Process: Intelligent Tutoring Systems

One of the most sophisticated tools capable of integrating the instruction and evaluation of writing is the Intelligent Tutoring System (ITS), (Allen, Jacovina, Danielle & McNamara, 2016). Most of the ITSs in their design integrate three main components: expert module or domain knowledge, student module or knowledge about the apprentice and tutorial module or pedagogical (Jiménez & Salazar, 2015, Rowley & Meyer, 2003). Through the interaction of these modules, the ITSs seem to be as effective as a human tutor in determining what to teach and how (VanLehn, 2011). An example of ITS is W-Pal (Roscoe & McNamara, 2013) which, following recommendations based on effective practices (Graham, Harris & Chambers, 2016), offers a combination of strategic instruction, practice, and formative feedback for adolescent writers. W-Pal consists of eight modules of strategic instruction that contemplate the three phases of the writing process. In order to offer an opportunity for extended practice and formative feedback, W-PAL is composed of two modules, based on the game and the practice. Through the AWE component, the texts receive a total score accompanied by suggestions for improvement that addresses specific objectives and solutions based on the instructed strategies. In this study, 141 Secondary Education students used W-Pal during the academic year. The analysis and comparison of the pre/post-test textual products revealed that after the instruction with W-pal, the texts were of greater length, with better structure, coherence and with a more sophisticated vocabulary. Rowley and Meyer (2003) used the ITS Computer Tutor for Writers (CTW), in 471 Primary and Secondary students. The interface provides a tutor called “Maestro” that guides the composition process. CTW is formed by 22 workspaces to instruct in each one of the writing processes. These spaces provide activities, examples, and suggestions to reach an expert level of writing. The results of the study did not show significant differences between the control group and

the experimental conditions the learning of the students of the control group decreased by 1%, and only 36 students of the experimental group obtained a gain of 11%. Similarly, Proske, Narciss and Proske (2012) developed the ITS called, Escribo, oriented to guide higher education students in the writing of scientific texts. Escribo divides the writing process into five subtasks: (a) guidance, (b) information gathering, (c) planning, (d) writing and (e) review. When the student completes the task, he is provided with informative feedback, thus giving him opportunities for repetition and correction of errors. In this study, 42 university students were assigned to two conditions, with (n = 18) and without writing (n = 24). The main significant effects were found in the writing time ($p<.05$), pre-writing time ($p <.01$) and textual comprehensibility ($p<.05$). Analogously, Holdich and Chung (2003) developed an ITS called Harry. As a human teacher, Harry provides specific expert knowledge of the narrative genre; It offers instructions and suggestions before, during and after the composition, dividing and combining the process of brainstorming, planning, composition and revision. In addition, through the Chektext software, it detects and guides in the identification and correction of errors, providing feedback for editing. The posttest results showed that through Harry, the students wrote better stories and employed a revision process characteristic of mature writers.

In the context of L2, the authors Heift and Rimrott (2008) used "E-Tutor", an ITS for German. "E-Tutor" contemplates different types of exercises to improve the mechanics of writing, providing individualized and specific feedback. The authors examined the responses of the students to three types of feedback: (a) metalinguistic with emphasis (shows the incorrect sentence, highlights the error and provides suggestions for the misspelled word); (b) metalinguistic (only indicates that an error has occurred and provides a list of suggestions); (c) repetition (suggests that an error may have occurred and shows the incorrect sentence with the error highlighted, but without providing a list of suggestions). Students achieved the most correct answers (72.6%) with the most explicit and prominent type of feedback (linguistic goal with emphasis), while students were less successful correcting their spelling mistakes with repetitive feedback (53.5%). Similarly, the authors Sung et al. (2016) developed an evaluation ITS to improve the summaries of Primary students. The system provides two types of feedback: semantics and concept. The first, compared the semantic similarity between the sentences of the student's summary and a summary of experts. The second provides a conceptual map to help understand the structure of the source text and highlights the words in the student's

summary that are relevant to the concept map. In this study, they examined the effects of both types of feedback. The results showed that a) only the feedback of the concept significantly affected the improvement of writing abstracts and, b) the number of revisions was significantly lower in the post-test. The authors argued that this phenomenon supports the idea that, once the writing skills are mastered, a satisfactory result can be obtained with fewer revisions. Finally, in Franzk et al. (2005) the authors used a "Summary Street" which is an LSA-based tutoring system that focuses on summary writing. The feedback is returned in the form of graphic interface, which including visual feedback on how well student's summaries adequately cover the main ideas and what topics need more work. Students using Summary Street® scored significantly higher in blind scoring on several measures of writing quality.

New Forms of Writing: WEB 2.0.

Web 2.0 and hypermedia is a reality that is present in the teaching of writing (Safieddine, 2014). Web applications, as Beatty (2013) states, have transformed learning by facilitating a wide variety of practices, including collaborative writing (Brodahl, Hadjerrouit & Hansen, 2011). It has been shown that when students work together to plan writing and/or revising their compositions, there is a positive impact on textual quality (Graham & Perin, 2007, Graham, Steve, McKeown & Harris, 2012). Two of the most frequent web tools for collaborative writing are the Blog and the Wiki, due to its ease of use and speed of implementation (Boulos, Maramba & Wheeler, 2006; Parker & Chao, 2007). In the study by Wichmann and Rummel (2013), 73 English Learners participated in a collaborative writing task using a wiki that included planning, writing and review activities. In order to enhance coordination, collaborative scripts (Scripts) were used, which provided a description of the optimal sequence with respect to the division of tasks. The students were assigned to one of two conditions: with script (n = 36) and without script (n = 37). The results of the study revealed that the condition of script + made a larger number of reviews and produced longer and more coherent texts. Arslan and Şahin-Kızıl (2010) used a blog for the development of the academic writing of 50 Higher Education students enrolled in an English course. The experimental group (n = 27) received process-oriented instruction and used the blog as part of their learning. Through the blog, students had the opportunity to be exposed to a larger number of activities and explanations related to grammar, vocabulary, or textual structure. They also received a greater amount of feedback from a wider audience: class students, other universities,

family members and an instructor. The results of the post-test revealed that the experimental group obtained a higher average mark in the variables content and textual organization, than those who did not use the blog.

In Primary Education, Nicolaidou (2013) examined the use of the electronic portfolio to instruct in peer feedback. Peer comments were evaluated and classified into two categories: direct corrective feedback (positive comment and three or more improvement suggestions) or indirect (general comment and error identification or positive comment and a reason). The analysis of the textual product showed a significant improvement in performance between the pretest (M = 62.6) and the posttest (M=76.5) and over time ($p<.01$). The qualitative feedback evaluation revealed that the students gradually provided more constructive feedback.

Discussion and Conclusion

With the technology of the 21st century, the way of writing has gone from being an exclusive activity of pencil and paper to being, increasingly, based on technology (Peterson-Karlan, 2011; Kiefer & Velay, 2016). Providing a writing environment requires considering not only the type of instruction, but also what tools are used to compose (Russell, 1997). Studies that focused on comparing handwriting and word processing only (Barrera III; Rule & Diemart, 2001), or with additional software (Englert, Wu & Zhao, 2005; Handley-More et al., 2003) showed mixed results in relation to productivity; However, variables such as textual quality, grammar or spelling were better when the word processor was used instead of handwriting (Englert, Wu & Zhao, 2005; Handley-More et al., 2003; Lowther, Ross & Morrison, 2003). Troubles in transcription can also be corrected through speech recognition; In the studies found, this software helped to reduce the number of misspelled words, increased textual length (Quinlan, 2004) and significantly improved quality (Macarthur & Cavalier, 2004). In the same line, technological aids in the form of schemes, organizers, or conceptual maps, encourage students to plan their textual product. This positively influences textual quality (Englert et al.,2007), structuring of ideas, and the amount of mental effort required (De Smet et al.,2012).

Taking advantage of artificial intelligence to create a system that can transfer a strategic, and individualized, knowledge has been a goal pursued by researchers (Holdich & Chung, 2003; Proske, Narciss & McNamara, 2012; Roscoe & McNamara, 2013; Rowley & Meyer, 2003). However, the research in this area does not yield consistent

results (Rodríguez-Málaga, Rodríguez & Fidalgo, 2019). In the study where the ITS provided mainly strategic instruction (Rowley & Meyer, 2003) versus a combination of this and feedback on textual product (Holdich & Chung, 2003; Proske, Narciss & McNamara, 2012; Roscoe & McNamara, 2013), the feedback of the system, seemed to be a decisive factor to achieve positive results in terms of quality, planning times and reviewing. In this sense, the literature demonstrates how the evaluation and emission of direct and formative feedback is a crucial factor that significantly improves written performance (Graham, Hebert & Harris, 2015). In studies focused on improving the review process, providing technology of evaluation (appointments), or an electronic database of textual models (Crinon & Legros, 2002), helped to: a) improve grammar and spelling (Li, Link & Hegelheimer, 2015); b) provide higher level macro-structural changes (Crinon & Legros, 2002) and with fewer revisions (Sung et al., 2016), when the feedback is explicit and suggests how to correct the error (Heif & Rimrott, 2008).

Involving students with digital tools such as electronic portfolios or in virtual publishing environments, such as blogs and wikis, contribute to improve writing performance. This is both in Primary Education students (Nicolaidou, 2013) and in Higher Education (Wichmann & Rummel, 2013) and in the learning of foreign languages (Arslan & Şahin-Kızıl, 2010). Due to their characteristics, they can be regarded as an adequate pedagogical alternative in which students, not only produce better texts, but also write for different tasks or purposes and for different audiences (Arslan & Şahin-Kızıl, 2010); it forces students to pay more attention to their writing (greater number of revisions) (Wichman, & Rummel, 2013) and to emit a higher quality feedback (Nicolaidou, 2013).

Based on the results obtained, we can affirm that technology can be a very promising tool to instruct in writing and even eliminate the barrier of learning disabilities (Macarthur & Cavalier, 2004; Englert, Wu & Zhao, 2005; Quinlan, 2004). However, the question is: is it an effective support resource? A direct answer to this question cannot be given for several reasons (Rodríguez-Málaga, Rodríguez & Fidalgo, 2019); According to the literature, the scarce, yet extremely diverse, technological range that is discussed makes the results difficult to generalize (Schwartz, Van Der Geest & Kreuzen, 1992; Macarthur, 2006). Even when researchers use the same technology, it is not guaranteed to obtain conclusive results, given the variability of contextual variables. These include: a) the quantity and quality of the teaching instruction; b) duration of the training and

practical demonstration of the tool; c) the previous experience of the teacher and the student with the tool; d) the profile and cognitive style of the student; e) the role of the instructor during the learning or, d) the type of task. These variables must be presented completely to the reader. Firstly, controlling and describing the content of these independent variables (Rijlaarsdam, Janssen, Rietdijk & van Weijen, 2017) would allow the replication of assessments in order to ultimately obtain a deeper understanding of the relationships between technology and writing instruction. Secondly, it is necessary to overcome the design limitations with representative samples in order to achieve conclusive, instead of exploratory data. Should one want to advance in the study of technology and writing, it is then necessary that researchers and educators continue working on the development or adaptation of tools in the aim to discover which technology allows for obtaining the highest performance in writing, and under what conditions.

Finally, another important question is the relationship between the processes of self-regulation, online learning and writing performance (Allen & McNamara, 2015). Still, learning in this type of virtual environments can be very demanding in terms of self-regulation and control of learning (Azevedo et al., 2012).

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CHAPTER 7: NEW LEARNING ENVIRONMENTS FOR WRITING: INTELLIGENT TUTORING SYSTEMS

This chapter faithfully reflects the content of: Rodríguez-Málaga, L., Rodríguez, C, & Fidalgo, R (2019). New learning environments for writing: intelligent tutoring systems. *Papeles del Psicólogo*, *40*(2), 133-140. https://doi.org/10.23923/pap.psicol2019.2895

Introduction

In recent decades, the relationship between technology and education has been an important focus of research in disciplines such as educational psychology or computer engineering (Lajoie & Azevedo, 2006). Within the field of writing instruction, numerous studies have focused on how technology may be able to support not only the teaching of written competence, but also the writing process of students with and without learning difficulties (Crinon & Legros, 2002; Englert, Wu, & Zhao, 2005; MacArthur, 2006; MacArthur, 2009; Morphy & Graham, 2012; Peterson-Karlan, 2007; Quinlan, 2004).

The debate surrounding the results on the effects of technology has been divided into two categories according to the technologies that support the different components of the writing process (Hayes & Flower, 1980). These are: a) the use of tools that support the more mechanical aspects of writing such as spelling, grammar or vocabulary (Barrera III, Rule & Diemart, 2001; Lowther, Ross, & Morrison, 2003; MacArthur & Cavalier, 2004) and b) the use of programs that support higher order processes, such as planning, metacognition or textual revision (De Smet, Brand-Gruwel, Leijten, & Kirschner, 2014; Wilson & Czik, 2016; Zaid, 2011). Within the first category, one of the most examined tools has been the word processor, whose significant effects on students' written performance has been well demonstrated (Goldberg, Russell, & Cook, 2003). Other types of software such as spellcheckers, word prediction software and speech recognition have also proven to be effective in supporting the transcription process, especially in students with learning difficulties (Peterson-Karlan, 2011). While it is true that, a priori, these tools add certain advantages with regard to writing by hand, the truth is that they have little to do with instruction in processes and subprocesses of a higher order such as metacognition or planning (Bangert-Drowns, 1993; MacArthur, 2006). In this sense, the research has highlighted the fundamental role played by the deployment of planning processes and textual revision in the acquisition of adequate written competence and how learners of all ages have problems developing these skills (MacArthur, Graham, & Fitzgerald, 2008). The technological advances have tried to respond to this problem by developing different systems or software packages to instruct in each of the processes and subprocesses that writing involves, although not necessarily in the same software package (Pan & Zbikowski, 1997). Consequently, it is possible to find specific tools to stimulate planning strategies, such as electronic maps and diagrams (De Smet, Brand-Gruwel, Broekkamp, & Kirschner,2012) as well as language processing programs, such as AWE (Automated

Writing Evaluation) or AEE (Automated Essay Evaluation) systems that offer a combination of feedback and evaluation that, while it varies in quantity, depending on the system, it does not vary not in quality (Shermis, Burstein, Elliot, Miel, & Folt, 2017; Warschauer & Ware, 2006).

One way to provide a context that simultaneously integrates the instruction of the entire writing process, in combination with practice and textual evaluation, is through intelligent tutoring systems (ITS) (Allen, Jacovina, Danielle, & McNamara, 2017). ITSs, as Lajoie and Azevedo (2006) state, are one of the most sophisticated tools in the area of virtual environments. Based on one-on-one interaction between the student and the system, their purpose is to involve students in various types of cognitive processing and to promote optimal learning (Lajoie & Azevedo, 2006; Shute, Lajoie, & Gluck, 2000). The majority of ITSs in their design, integrate three main modules (Carbonell, 1970; Cataldi & Lage, 2009; Lenhard, Baier, Endlich, Schneide, & Hoffmann, 2013): a) a tutorial module that instructs in knowledge, selects teaching strategies and monitors the student's performance during the lesson attending to their learning style; b) a student module that stores knowledge about the learner through continuous cognitive assessment; c) a domain module that collects the whole of the content, materials and other system parameters necessary for the functioning of the ITS. The interaction between these modules seems to emulate the behavior of a human tutor by dynamically and systematically controlling and adapting students' individual learning (Azevedo & Hadwin, 2005).

Well-designed ITSs have shown significant gains in learning from very different domains (Shute, Lajoie, & Gluck, 2000). Wijekumar, Meyer, and Lei (2013) designed an ITS to improve the reading comprehension of 4th and 5th grade primary school students. The ITS based on strategic instruction, provided practice with scaffolding and transfer tasks, as well as individual evaluation and feedback cycles on performance in each task. The authors found that the classrooms that integrated the ITS compared to the control groups showed a better performance with moderate to large effect sizes in all the evaluation measures. In the same line, Graesser et al. (2003) implemented "Why/AutoTutor" a tutor which guided in the resolution and construction of answers to qualitative physics problems, offering evaluation and feedback on the learning of university students. The results of the study revealed that the group that used Why/AutoTutor obtained the highest learning gain compared to the group that received

the same content, but in the traditional format, and the control group without learning material. Therefore, and according to Vanlehn (2011), ITSs are effective means of instruction insofar as they provide guidance and learning materials, and they can accurately assess students, diagnose performance deficiencies and use this information to adapt the learning experience appropriately (Shute, Lajoie, & Gluck, 2000).

Based on the above, there is no doubt about the growing interest of researchers and educators in the use of new technologies, and the relationship between these technologies and writing performance. Therefore, it is necessary to analyze the published research to offer up-to-date information that has implications for educational practice. Through a systematic review, it is intended to show the state of the art around what types of ITS are available for learning writing skills and what their effects are.

Method

Search and selection process

The systematic search included the analysis of the works published in the period from 2000 to the present. The starting date was 2000, coinciding with the rise of ICT in the field of writing (Peterson-Karlan, 2011). The following databases were used: Web of Science, ScienceDirect and Scopus, using the following keywords: writing, writing instruction, and intelligent tutoring systems. In parallel, a manual search was carried out on the following meta-analyses: "Meta-analysis of writing instruction for adolescent students" (Graham & Perin, 2007); "Meta-analysis of writing instruction for students in the Elementary grades" (Graham, McKeown, Kiuhara, & Harris, 2012); "Teaching children to write: A meta-analysis of writing intervention research" (Koster, Tribushinina, Jong, & Bergh, 2015); "Meta-analysis of single subject design writing intervention research" (Rogers & Graham, 2008); "Meta-analysis of writing interventions for students with learning disabilities" (Gillespie & Graham, 2014).

Inclusion and exclusion criteria

In line with the objective of the present study, for the investigations to be included in this study, the following inclusion criteria were taken into account. Studies had to (a) have as their main objective the analysis of the effect of the tool on the written product and/or in the cognitive processes involved in writing, that is, planning, transcription and revision (Hayes & Flower, 1980); (b) be an experimental, quasi-experimental or single-

case study; (c) include a measure of the quality of the written product and/or improvement in cognitive processes; (d) be studies of primary, secondary or higher education.

As exclusion criteria, the following measures were adopted: (a) studies whose interventions took place in a sample of students with special educational needs were discarded (given the heterogeneity of the SEN concept and due to the very nature of these types of students who require specific interventions different from the usual ones (Mónico, Pérez-Sotomayor, Areces, Rodríguez, & García, 2017)); (b) investigations in which the ITS was exclusively applied as a support tool in the writing process without offering any type of instruction were excluded; (c) book chapters or unpublished works were also not taken into account for this review.

Coding of studies

The content of each article was codified in a database that include the following fields: a) authors; b) country; c) objective; d) design; e) sample; f) intelligent tutoring system; g) evaluated variables; and h) results obtained. The selected studies are shown in Table 1.

Table 1

Synthesis of the articles included in the review according to the inclusion criteria

Source	Country	Objective	Methodological Design	N	Type of Sample	Intelligent Tutoring System	Evaluated Variables	Results
Rowley y Meyer, (2003)	USA	To check the effectiveness of a smart tutor in improving writing performance	Quasi-experimental with control group	471	Primary and secondary education	CTW	Structure Coherence Vocabulary Grammar	There are no significant differences between the experimental and the control group
Roscoe y McNamara, (2013)	USA	To evaluate the effect of an ITS on written performance	Quasi-experimental without control group	141	Secondary education	W-Pal	Length Structure Cohesion Lexicon	Significant differences pre/posttest
Proske, Narciss y McNamara, (2012)	USA	To investigate whether the use of an ITS facilitates learning to	Quasi-experimental with control group	42	Higher education	Escribo	Textual quality	Significant differences between the experimental and the control groups.

		write of scientific text					Productivity Time on the task	There are no significant differences between the experimental and control groups
Holdich y Chung, (2003)	UK	To test the hypothesis that an ITS can change the way children approach the task of writing and improve their performance	Case study with control group	5	Primary Education	Harry	Vocabulary Punctuation Productivity Syntaxis	Significant differences between experimental subjects and control subjects
Sung et al. (2016)	Island of Taiwan	To improve summarizing skills	Quasi-experimental without control group	154	Primary Education	ITS based on latent semantic analysis	Productivity Content N. º of revisions	Significant differences between the experimental groups (with/without semantic and

								conceptual feedback)
Franzke et al. (2005)	USA	To evaluate the effect of an intelligent tutor in the learning of writing abstracts	Quasi-experimental with control group	121	Secondary education	Summary Street	Quality Organization Mechanics Style	Significant differences between the experimental and control group

Note: ITS= Intelligent Tutoring System

Results

The search process resulted in 542 references the titles and abstracts of which were examined. After considering the inclusion criteria, 98% were excluded, with a total of 6 empirical studies being obtained. Figure 1 shows the flow chart representing the procedure followed in the literature search. The description of the studies is detailed below according to the purpose of the system: a) designed to instruct and support the writing process (n = 4); b) designed to instruct in specific writing skills (e.g., summarizing, argument and counter-argument or creative writing) (n = 2).

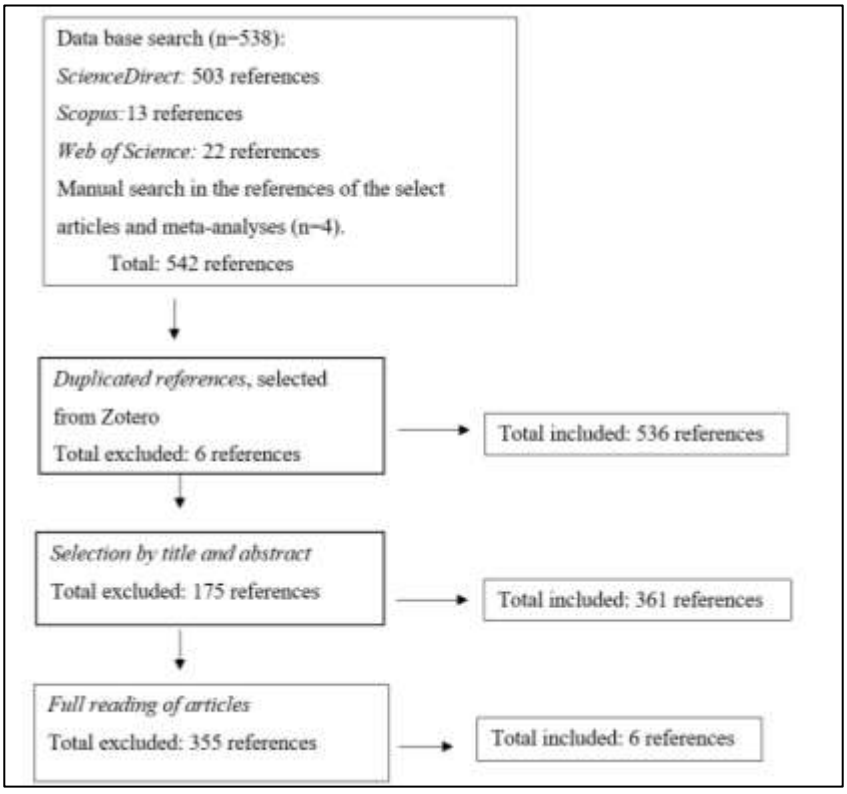

Figure 1. Selection process of the sample of articles to be analyzed.

ITS designed to instruct in the writing process.

Holdich and Chung (2003) implemented a smart tutor, Harry, with elementary school students to provide instruction in higher order processes. Harry is based on an expert writing model that imparts knowledge about different subprocesses; brainstorming, planning, composition, proofreading-editing, offering scaffolding during each of the tasks. Using the 'What's next? strategy, the student builds the narrative step by step. The posttest results showed that the students who used Harry wrote better stories

and used a proofreading process characteristic of mature writers. In the study by Rowley and Meyer (2003), the CTW (Computer Tutor for Writers) software was used with primary and secondary school students. With the help of a tutor called "Maestro", the students had to complete different work modules distributed in five categories: a) setting objectives and analyzing ideas; (b) analysis of the topic and techniques for organizing ideas; (c) planning and preparation of plans and diagrams; (d) writing of the text: creation of sentences and paragraphs; (e) proofreading and selection of the editing process. The authors did not find significant differences in the textual quality of the control and experimental groups. The learning of the students in the control group decreased by 1%, and only 36 students in the experimental group obtained again of 11%. In the same line Proske, Narciss and Proske (2012) developed a learning environment, Escribo [I write], to guide and facilitate the writing of scientific texts to students of higher education. Escribo organizes the writing process into five subtasks so that students acquire awareness and knowledge about each of the activities involved in successful academic writing: a) collecting information; b) planning; c) writing; d) proofreading the text. When the students finished the task, they were provided with informative feedback, giving them opportunities to go back and repeat and correct textual errors. The authors showed that the university students who worked with Escribo wrote more coherent texts and spent more time planning. The authors Roscoe and McNamara (2013) designed W-Pal (Writing Pal) a system to improve the writing of secondary school students. W-Pal is composed of eight modules of strategic instruction taught by pedagogical agents through video lessons, in combination with games-based practice and writing practice, offering automated training evaluation and feedback. The analysis and comparison of the pre/posttest textual products revealed that after instruction using W-pal, the texts were of greater length, with better structure, coherence and with a more sophisticated vocabulary.

ITS designed for instruction in specific writing skills

In order to facilitate the task of summarizing, Franzke, Kintsch, Caccamise, Johnson and Dooley (2005) used Summary Street®, a tutor that offers a context of support for students from 13 to 14 years to practice writing summaries. Through latent semantic analysis, Summary Street compares the similarity of meaning between a student's summary and the source text, offering information that allows us to know the extent to which the summary adequately covers the main ideas and the aspects that need more work. The feedback offered by the system involved the students in successive review

cycles until the content criteria were met. The research showed that summaries written with Summary Street were superior in several measures: general quality, more complete, and better organized content, even when the original texts became longer and more complex. Similarly, Sung et al. (2016) developed an intelligent evaluation system to improve the summary writing of primary school students. The system provided two types of feedback: semantics and concept. The first compared the semantic similarity between sentences of the student's summary and a summary by experts. The second provided a conceptual map to help understand the structure of the source text and highlighted the words in the student's summary that were relevant to the concept map. In this study, the authors examined the effects of both types of feedback. The results showed that a) only the feedback on the concept significantly affected the improvement in writing summaries and b) the number of revisions was significantly lower in the posttest. The authors argued that this phenomenon supports the idea that, once writing skills are mastered, a satisfactory result can be obtained with fewer revisions.

Discussion and Conclusions

Research on written composition is a complex task insofar as writing is a multidimensional phenomenon that is difficult to master (De la Paz, 2007; Flower & Hayes, 1980). From the scientific advances of the last years it is possible to affirm that, the way to control it depends, not only on the explicit or implicit instruction in the knowledge and the strategies for developing it, but also on the context in which the writing is produced (Graham, Harris, & Chambers, 2016; Graham, Gillespie, & McKeown, 2003). Providing a supportive context for learning to write requires consideration of the tools that are used for both instruction and composition (Graham, Gillespie, & McKeown, 2003). A promising tool is the ITS which, based on artificial intelligence, allows us to transfer strategic and individualized knowledge accompanied by a dynamic evaluation of the student's progress (Holdich & Chung, 2003; Proske, Narciss, & McNamara, 2012; Roscoe & McNamara, 2013; Rowley & Meyer, 2003). However, as noted in the present work, the research does not yield consistent results. One possible explanation is in relation to the ability of the system to provide formative feedback. In the study by Rowley and Meyer (2003), although it instructed in all of the processes involved in writing, no feedback was offered while the students completed the writing tasks. On the contrary, in the investigations by Holdich and Chung (2003), Proske, Narciss, and McNamara (2012), and Roscoe and McNamara (2013), although instruction

was provided in a smaller number of processes, they offered a combination of practice and feedback on the textual product that seemed to be a decisive factor in achieving positive results in terms of textual quality.

In this aspect, the literature has shown that giving constructive feedback as part of teaching is a crucial factor that significantly improves written performance (Graham, Hebert, & Harris, 2015). However, the control of such feedback, that is, what type of feedback it is (positive or negative) (Mitrovic, Ohlsson, & Barrow, 2013), how it should be shown (giving-answer strategies, or prompting-answer strategies) (Ferreira & Atkinson, 2009), and at what point in the learning, represents one of the most difficult aspects to solve (Allen, Jacovina, & McNamara, 2017; Baker, Gersten, & Scanlon, 2002). While this decision should be derived from theoretical models and, to a greater extent, from the results of the empirical research (Shute, Lajoie, & Gluck, 2000), the fact is that the poor and insufficient research linked to the actual task of writing, characterized by being "an ill-defined domain" represents a challenge for researchers (Aleven et al., 2008; Fournier-Viger, Nkambou, & Nguifo, 2010; Roscoe & McNamara, 2013). However, there are more and more ITSs that incorporate AES (automated essay scoring) and AWE (automated writing evaluation) systems as advisory tools that provide performance data at the process or product level. In the studies where the ITS integrated these systems (Franzke et al., 2005; Proske, Narciss, & McNamara, 2012; Roscoe & McNamara, 2013; Sung et al., 2016), the results suggested that students not only improve in aspects at a mechanical or microstructural level such as grammar or spelling, but also at the macrostructural or content level, even with fewer revisions (Sung et al., 2016).

Based on the results derived from this review, we can affirm that ITSs can be a support tool for teachers as they avoid some inherent difficulties in the teaching process, such as the nature of the class itself or the lack of time. In this sense, ITSs can offer greater availability to focus on the set of instructional objectives involved in writing (Graham, Gillespie, & McKeown, 2013), such as how to involve students in planning or revision activities, beyond teaching spelling or grammar; providing individual and specific support to each student according to their needs or the possibility of continuous and immediate practice and feedback.

However, the question is, are ITSs a fully effective resource? A direct answer to this question cannot be given for several reasons. First, and according to the literature

(MacArthur, 2006), few studies have been developed in this area, which makes it difficult to generalize the results. Even when researchers use the same technology, it is no guarantee for obtaining conclusive results while contextual variables play a crucial and mediating role in the results. Contextual variables such as the role of the teacher in relation to the ITS, the duration of training and practical demonstration of the use of the tool, the learning environment (formal or informal), the previous experience of the teacher and the student with the software or learning activities, and the instructional objectives, must be variables presented completely to the reader (Chauhan, 2017; Schmid et al., 2014; Schwartz, Van Der Geest, & Kreuzen, 1992). It is of utmost importance to control and describe the content of these independent variables (Rijlaarsdam, Janssen, Rietdijk, & van Weijen, 2017) that would allow the replication of the interventions, ultimately, to obtain a deeper understanding of the relationships between technology and writing instruction. Therefore, if we want to advance in the study of artificial intelligence and its impact on instruction, it is necessary for research to continue working on the understanding, development or adaptation of this type of technology to discover which elements generate the greatest advances in performance and under what conditions.

To conclude, we ask ourselves what happens when students tackle learning in this type of virtual environment. In this sense, learning in virtual environments is especially demanding in terms of self-regulation of behavior (Azevedo et al., 2012). Consequently, it seems to be an important issue to examine the relationship among the processes of self-regulation, online learning, and writing performance (Allen & McNamara, 2015).

Limitations of the study

Given the small number of studies included in our sample, the potential of the conclusions is limited. However, for our purpose, that is, to inform about new learning environments and instruction in writing, we find that the results are significant. It would be interesting if future studies could expand and verify the previous findings with research that uses not only ITSs, but also other types of technological tools.

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CHAPTER 8: DISCUSSION AND CONCLUSIONS

Discussion and Conclusions

This doctoral thesis comprises two empirical studies (chapters 3, 4 and 5) in which a Cognitive Self-Regulation Instruction CSRI program has been implemented to improve the written competence of 4th grade students. Both empirical studies have been carried out following two principal objectives: the first objective (study 1, chapters 3 and 4) analyzes the effect of the different instructional components of the Cognitive Self-Regulation Instruction (CSRI) program focused on planning process. The second objective (study 2, chapter 5) is to analyze the effect of the CSRI program focused on the textual product compared to another that additionally includes explicit instruction in the planning process.

In relation to the efficacy of the CSRI program, the results of both empirical studies have shown that CSRI students exhibited improvements in the quality of their texts compared to the control (who received traditional instruction based on text analysis). Therefore, our results are consistent with previous studies of strategic-focused instruction (e.g., Bouwer et al., 2018; Rosário et al., 2019; Saddler et al., 2019; Shen & Troia, 2018) and also by means of CSRI in particular (see review Fidalgo & Torrance 2017), with particular emphasis on the importance of instructing students in processes of high cognitive level, such as planning, to improve their written competence. More specifically, in relation to the componential analysis of the CSRI program, study 1 compared two experimental conditions relative to control condition. Both experimental conditions differed in the order of implementation of their instructional components: experimental condition 1 began with the direct instruction component, followed by peer practice and modelling; experimental condition 2 began with the modelling component, followed by peer practice and direct instruction. The results of this study have shown significant benefits of the CSRI program after four intervention sessions (that is, after the first two components) with no differences between the experimental conditions. In addition, it is by adding the peer practice component that the largest learning gains occur (experimental students produced texts that were assessed as more coherent, better structured, and of higher quality). This is consistent with previous research that emphasizes the need that students practice their writing in a supportive environment where the instructor guides the students, clarifying, monitoring, and reinforcing the composition task (e.g., De Smedt et al. 2018 ; Graham et al. 2012; Koster et al. 2017; Yarrow & Topping, 2001). Additionally, to obtain conclusions about CSRI in a more valid and reliable way, students

were evaluated in a textual genre that was not the focus of instruction (transfer task, chapter 4). The results obtained show that after the six intervention sessions the experimental conditions wrote texts with greater structure and coherence than the control condition. Again, no differences were obtained between the two instructional component sequences. This result is in agreement with the previous literature that demonstrates the efficacy of strategic-focused instruction, even in textual genres that are not the focus of instruction (Fidalgo et al., 2015; Graham et al., 2005).

Regarding to the second objective, namely, the planning-focused instructional content and the way it should be taught (chapter 5), the study 2 compared two experimental conditions (that differ in the instructional content) relative to a control condition. In the full-CSRI (experimental condition 1), students received a strategic approach to set appropriate product goals along with planning strategies. On the contrary, in the brief-CSRI (experimental condition 2), the direct teaching of planning procedures was absent. The results have shown that training that includes explicit instruction in the planning process, together with instruction in the textual product (knowledge of textual typology, learning to set product goals) is more beneficial (in terms of coherence and textual quality) than training that has only product instruction (without explicit instruction in the planning process). This results is in line with previous research (Bouwer, et al., 2018; Saddler et al., 2019; Shen & Troia, 2018) on the benefits of teaching planning procedures, because it help younger writers to think and organize content before starting to write and reduce cognitive overload during writing (Kellogg, 2018; Rijlaarsdam et al., 2011).

This doctoral thesis also includes two reviews of the literature which have been carried out following the third main objective, namely, to analyze the published research on new technologies focused on supporting the teaching-learning process of writing (chapters 6 and 7).

Based on the results obtained, we can affirm that technology can be a very promising tool to instruct in writing, and even eliminate the barrier of learning disabilities (Englert et al., 2005; Macarthur & Cavalier, 2004; Quinlan, 2004). Although there is a wide range of tools to support the instruction of each process involved in written composition (revision, planning or transcription), the only tool capable of simultaneously integrating the teaching of the entire writing process, in combination with practice and textual assessment, is the intelligent tutoring system (ITS). In this regard, and based on

the results of the second review, the ITS can be a supporting tool for teachers, as they avoid some inherent difficulties in the teaching process (such as the nature of the class or the lack of time). In this sense, ITSs can offer greater availability to focus on the set of instructional objectives involved in writing such as how to involve students in planning or revision activities, beyond teaching spelling or grammar; providing individual and specific support to each student according to their needs or the possibility of continuous and immediate practice and feedback (e.g., Holdich & Chung, 2003; Proske et al., 2012; Rowley & Meyer, 2003).

In relation to the question of whether the ITS is an effective resource to address the teaching-learning process of written competence, as it is verified in the literature review, the research does not yield consistent results. The studies carried out in this area are few and the results are difficult to generalize. Even when researchers use the same type of technology (ITSs), the type of formative feedback provided by the software and contextual variables (the role of the teacher in relation to the ITS, duration of training, practical demonstration of the tool, experience with the ITS) play a crucial and mediating role in the results. To gain a deep understanding of the relationships between these types of systems and writing instruction, future research needs to control and describe the content of contextual (independent) variables (Rijlaarsdam et al., 2017). In this way, it is possible to replicate the interventions and to discover which elements generate the greatest advances in performance and under what conditions.

In summary, for students to be successful academically, they must learn how to write. Therefore, a basic objective of teachers and educators in Primary Education is to teach students how to write effectively. Unfortunately, writing instruction in most classrooms is insufficient or inappropriate (Graham, 2018b). For this reason, the development of effective instructional practices is essential, so that teachers can guarantee an adequate written competence according to the needs of the students. The two experimental studies that comprise this doctoral thesis empirically validate the strategy-focused program CSRI to improve the written competence of 4th grade students. In particular, the efficacy of instructional techniques, such as direct instruction, modelling, or peer practice has been proven; but also, the importance of explicitly teaching the planning process to ensure an adequate performance in writing. Both empirical studies underline, not only the importance of promoting a writing environment in which students acquire the writing knowledge and practice it, but also the message that writing is a

complex skill that cannot be learned automatically. Writing must be taught effectively, and this requires that teachers spend time teaching it. The CSRI program has been shown to be a good instructional tool to promote this. With all of this, we hope that educators contextualize this knowledge and, consequently, adapt this type of instruction in their classrooms in the best possible way.

Conclusions

1. The strategy-focused program CSRI is more beneficial than traditional instruction (based on text analysis) for 4th grade students.
2. For 4th grade students, any combination of instructional components (direct instruction followed by peer practice or, alternatively, modelling followed by peer practice) is effective.
3. Explicitly teaching 4th grade students the planning process is more effective than traditional instruction and instruction based on strategic approach to set product goals (without instruction in the planning process).
4. There is a wide variety of technologies that show positive results to support the teaching-learning process of writing in the different educational stages. Among all of them, Intelligent Tutoring Systems (ITSs) is one of the most promising tools, with the greatest potential for writing instruction.

Limitations

Before closing, we should mention common limitations of both empirical studies as well as challenges for future research. First, further research is needed to replicate the studies using a larger sample and more homogeneous groups (i.e., different school contexts with different students, for example, students with learning difficulties). Another limitation was related to the lack of a specific assessment of writing strategies, metacognitive strategies, and self-regulated learning. This limitation could be overcome through analyzing student text per se (re-writing, errors or symbols and abbreviations that represent the strategy used by each student). An additional limitation to the studies is related to the lack of a specific assessment of social validity (i.e., the acceptability of and satisfaction with the intervention procedures; Koster et al. 2017). This limitation could be overcome through interviews or questionnaires at different points of intervention. Finally, we suggest that it may be fruitful that future studies using online measures which

allow us to ascertain the distribution of writing processes (planning, revision and transcription) during composition and its contribution to text quality (Lopez et al., 2019).

Finally, in relation to the revision about technologies, writing instruction and, in particular about intelligent tutor systems, an obvious criticism is that given the small number of studies included in the sample, the potential of the conclusions is limited. It would be interesting if future studies could expand and verify the previous findings with a larger sample of studies.

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CAPITULO 9: DISCUSIÓN Y CONCLUSIONES

Esta tesis doctoral comprende dos estudios empíricos (capítulos 3, 4 y 5) en los que se ha implementado un programa de instrucción estratégica y autorregulada denominado CSRI (Cognitive Self-Regulation Instruction) para la mejora de la competencia escrita del alumnado de 4º de Educación Primaria. Ambos estudios empíricos se han realizado siguiendo dos objetivos principales: el primer objetivo (estudio 1, capítulos 3 y 4) analiza el efecto de los diferentes componentes instruccionales del programa CSRI enfocado en el proceso de planificación. El segundo objetivo (estudio 2, capítulo 5) es analizar el efecto del programa CSRI enfocado en el producto textual frente al mismo programa incluyendo instrucción explícita en el proceso de planificación.

En relación con la eficacia del programa CSRI, los resultados de ambos estudios empíricos han demostrado que los estudiantes CSRI, exhibieron mejoras en la calidad de sus textos en comparación con el control (que recibió instrucción tradicional basada en análisis de texto). Por lo tanto, nuestra conclusión va en la línea de estudios previos sobre la instrucción estratégica en general (por ejemplo, Bouwer et al., 2018; Rosário et al., 2019; Saddler et al., 2019; Shen y Troia 2018) y CSRI en particular (ver revisión Fidalgo y Torrance, 2017) acerca de la importancia de instruir al alumnado en procesos de alto nivel cognitivo como es la planificación para mejorar su competencia escrita. En concreto, en relación con el análisis componencial del programa CSRI, en el estudio 1 comparamos dos condiciones experimentales frente a una condición de control. Ambas condiciones experimentales diferían en el orden de implementación de sus componentes instruccionales. La condición experimental 1 comenzó por el componente de instrucción directa, seguido de practica en pares y modelado; la condición experimental 2 comenzó con el componente de modelado, seguido de practica en pares e instrucción directa). Los resultados de este estudio han demostrado beneficios significativos del programa CSRI después de cuatro sesiones de intervención (esto es, después de los dos primeros componentes) sin diferencias entre las condiciones experimentales. Más específicamente, es al agregar el componente de práctica entre pares cuando se produce las mayores ganancias de aprendizaje (los estudiantes de las condiciones experimentales produjeron textos que fueron evaluados como más coherentes, mejor estructurados y de mayor calidad). Esto es consistente con investigaciones previas que enfatizan la necesidad de que los estudiantes practiquen su escritura en un ambiente de apoyo donde el docente guíe, monitorice y refuerce la tarea de composición (por ejemplo, De Smedt et al. 2018;

Graham et al.2012; Koster et al.2017; Yarrow y Topping 2001). Adicionalmente, para obtener conclusiones sobre CSRI de una manera más válida y confiable, se evaluó a los estudiantes en un género textual que no fue foco de instrucción (tarea de transferencia, capitulo 4). Los resultados obtenidos demuestran que tras las seis sesiones de intervención las condiciones experimentales escribieron textos con mayor estructura y coherencia que la condición de control. De nuevo, no se obtuvieron diferencias entre las dos secuencias de componentes instruccionales. Este resultado está en consonancia con la literatura previa que demuestra la eficacia de la instrucción estratégica y autorregulada incluso en géneros textuales que no son foco de instrucción (por ejemplo, Fidalgo et al., 2015; Graham et al., 2005).

En cuanto al contenido de instrucción enfocado en la planificación y la manera en la que este debe ser enseñado (capítulo 5), los resultados han demostrado que el entrenamiento que incluye instrucción explícita en el proceso de planificación en combinación con la instrucción en el producto textual (conocimiento de la tipología textual, aprender a establecer metas del producto) es más beneficiosa que el entrenamiento que incluye sólo la instrucción de producto (sin instrucción explícita en el proceso de planificación). Este resultado es similar a investigaciones previas (Bouwer, et al., 2018; Saddler et al., 2019; Shen y Troia, 2018) sobre los beneficios de instruir en procedimientos de planificación, porque ayudan a los escritores más jóvenes a pensar y organizar el contenido antes de comenzar a escribir y reducir la sobrecarga cognitiva durante la escritura (Kellogg, 2018; Rijlaarsdam et al., 2011).

Esta tesis doctoral comprende además dos revisiones de la literatura que se han realizado siguiendo el tercer objetivo principal, a saber, analizar las investigaciones publicadas sobre nuevas tecnologías enfocadas a apoyar el proceso de enseñanza-aprendizaje de la escritura (capítulos 6 y 7).

Con base en los resultados obtenidos, podemos afirmar que la tecnología puede ser una herramienta muy prometedora para instruir en el proceso de escritura, e incluso eliminar la barrera de las dificultades de aprendizaje (Englert et al., 2005; Macarthur y Cavalier, 2004; Quinlan, 2004). Si bien existe una amplia gama de herramientas para apoyar la instrucción de cada proceso involucrado en la composición escrita (revisión, planificación o transcripción), la única herramienta capaz de integrar simultáneamente la enseñanza de todo el proceso de escritura, en combinación con la práctica y la evaluación textual, es el Sistema de Tutoría Inteligente (STI). En este sentido, y en base a los

resultados de la segunda revisión, los STIs pueden ser una herramienta de apoyo para los docentes, ya que evitan algunas dificultades inherentes al proceso de enseñanza (como la propia naturaleza de la clase o la falta de tiempo). En este sentido, los STIs pueden ofrecer una mayor disponibilidad para enfocarse en el conjunto de objetivos instruccionales involucrados en la escritura, tales como involucrar a los estudiantes en actividades de planificación o revisión, más allá de enseñar ortografía o gramática; brindar apoyo individual y específico a cada alumno de acuerdo con sus necesidades o la posibilidad de una práctica y retroalimentación continua e inmediata (por ejemplo, Holdich y Chung, 2003; Proske et al., 2012; Rowley y Meyer, 2003).

En relación con la cuestión de si el STI es un recurso eficaz para abordar el proceso de enseñanza-aprendizaje de la competencia escrita, como se constata en el trabajo de revisión, la investigación no arroja resultados consistentes. La conclusión aquí es que los estudios desarrollados en esta área son pocos y los resultados difíciles de generalizar. Aun cuando los investigadores emplean el mismo tipo de tecnología (STIs), el tipo de feedback formativo proporcionado por el STI junto con las variables contextuales (el rol del docente en relación con el STI, duración del entrenamiento, demostración práctica de la herramienta, experiencia previa con el STI) juegan un papel crucial y mediador de los resultados. Para obtener una comprensión profunda de las relaciones entre este tipo de sistemas y la instrucción en escritura es necesario que futuras investigaciones controlen y describan el contenido de las variables contextuales o independientes (Rijlaarsdam et al., 2017). De esta manera es posible replicar las intervenciones y descubrir qué elementos generan los mayores avances en el rendimiento y en qué condiciones.

En resumen, para que los estudiantes tengan éxito académico, deben aprender a escribir. Por lo tanto, un objetivo básico de los profesores y educadores de la Educación Primaria es enseñar a los alumnos a escribir de forma eficaz. Desafortunadamente, la instrucción de escritura en la mayoría de las aulas es insuficiente o inadecuada (Graham, 2018b). Por ello, el desarrollo de prácticas instruccionales efectivas es fundamental para que los docentes puedan garantizar una adecuada competencia escrita de acuerdo con las necesidades de los estudiantes. Los dos estudios empíricos que componen esta tesis doctoral validan empíricamente el programa de instrucción estratégica y autorregulada CSRI para mejorar la competencia escrita de los alumnos de 4º de Educación Primaria. En particular, se ha comprobado la eficacia de técnicas instruccionales como la instrucción directa, el modelado o la práctica entre pares; pero también, la importancia de

enseñar explícitamente el proceso de planificación para asegurar un desempeño adecuado en la escritura. Ambos estudios empíricos subrayan no solo la importancia de promover un entorno de escritura en el que los estudiantes practiquen los conocimientos aprendidos, sino también el mensaje de que la escritura es una habilidad compleja que no se puede aprender automáticamente. La escritura debe enseñarse y mostrarse de manera efectiva y para ello es necesario que los docentes dediquen tiempo a su enseñanza. Se ha demostrado que el programa CSRI es una buena opción como herramienta instruccional para promover esto. Así, esperamos que los educadores contextualicen este conocimiento y, en consecuencia, adapten este tipo de instrucción en sus aulas de la mejor manera posible.

Conclusiones

1. El programa estratégico CSRI es más efectivo que la instrucción tradicional (basada en el análisis de textos) en el alumnado de 4º de Educación Primaria.
2. Para este alumnado cualquier combinación de componentes instruccionales (instrucción directa seguido de practica entre pares o modelado seguido de practica entre pares) es efectiva.
3. Enseñar a estos alumnos de manera explícita el proceso de planificación es más efectivo que la instrucción tradicional y la instrucción basada en un enfoque estratégico centrado en establecer metas de producto (sin instrucción en el proceso de planificación).
4. Existe una amplia variedad de tecnologías que muestran resultados positivos para apoyar el proceso de enseñanza-aprendizaje de la escritura en las diferentes etapas educativas. De todas ellas, es el Sistema de Tutoría Inteligente (STI) una de las herramientas más prometedoras y con mayor potencial para la instrucción en el proceso de escritura.

Limitaciones

Es necesario mencionar las limitaciones comunes de ambos estudios empíricos, así como los desafíos para futuras investigaciones. Primero, se necesita más investigación para replicar los estudios usando una muestra más grande y grupos más homogéneos (es decir, diferentes contextos escolares con diferentes estudiantes, por ejemplo, estudiantes con dificultades de aprendizaje). Otra limitación estuvo relacionada con la falta de una evaluación específica de las estrategias de escritura, estrategias metacognitivas y aprendizaje autorregulado. Esta limitación podría superarse analizando el texto del alumno (reescritura, errores o símbolos y abreviaturas que representan la estrategia

utilizada por cada alumno). Una limitación adicional de los estudios está relacionada con la falta de una evaluación específica de la validez social (es decir, la aceptabilidad y satisfacción con los procedimientos de intervención; Koster et al.2017). Esta limitación podría corregirse mediante entrevistas o cuestionarios en diferentes puntos de intervención. Finalmente, sugerimos que puede ser fructífero que futuros estudios utilicen medidas en línea que permitan conocer la distribución de los procesos de escritura (planificación, revisión o transcripción) durante la composición y su contribución a la calidad del texto (López et al., 2019).

Finalmente, en relación con la revisión sobre tecnologías e instrucción en escritura y, en particular, sobre los sistemas de tutoría inteligente, una crítica obvia es que, dado el reducido número de estudios incluidos en la muestra, el potencial de las conclusiones es limitado. Sería interesante si los estudios futuros pudieran ampliar y verificar los hallazgos anteriores con una muestra más amplia de estudios.

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