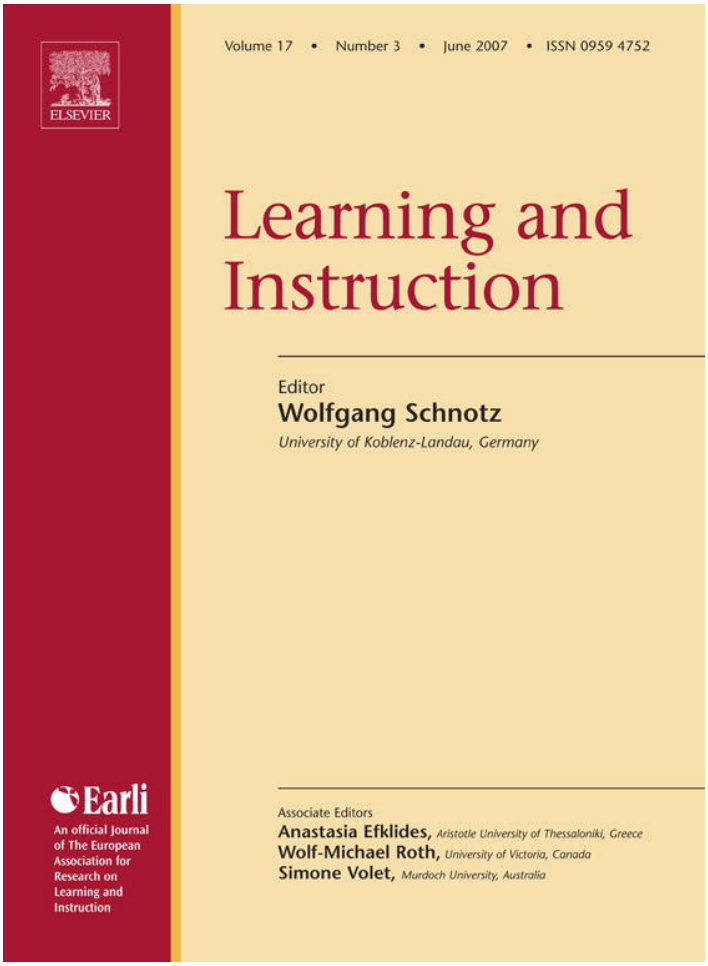

ELSEVIER

Learning and Instruction 17 (2007) 265–285

Learning and Instruction

www.elsevier.com/locate/learninstruc

The teachability and effectiveness of cognitive self-regulation in sixth-grade writers

Mark Torrance [a,*], Raquel Fidalgo [b], Jesús-Nicasio García [b]

[a] *Staffordshire University, Centre for Educational Psychology Research, Psychology Department, College Road, Stoke-on-Trent ST4 2DE, UK*

[b] *León University, Spain*

Abstract

Seventy-one normally functioning Spanish sixth-grade students participated in classroom-based training in cognitive strategies for preplanning and substantive revision of expository text. Short essays completed by these students pre-intervention, post-intervention, and after a 12 week delay were compared with those of an ordinary-curriculum control ($n = 24$). Online, self-report process measures suggested that training resulted in a substantial and sustained increase in preplanning as a result of the intervention, but little increase in the extent to which students revised their text. Product measures indicated a substantial and sustained increase in text quality and improved use of coherence ties.

Keywords: Writing; Planning; Revision; Self-regulation; School

1. Introduction

Young writers find text production difficult for broadly two reasons (Bereiter & Scardamalia, 1982; Berninger et al., 1992). First, transcribing language onto the page requires both knowledge of spelling and the grapho-motor skills necessary for forming letters. In most education systems children do not start to develop these until the age of four or five and they take practice to master. Second, writing is a largely solitary activity. Children typically and from a young age produce language in the context of dialogue which affords many opportunities for both cueing content to talk about and monitoring the communicative effect of the language that is produced. By contrast, most writing – and certainly the kinds of writing in which teachers would most like children to develop expertise – occurs in contexts where this support is absent.

These factors combine to make writing cognitively demanding, with writers often at risk of overloading their available cognitive resources (Kellogg, 1988; McCutchen, 1996). Both experimental and anecdotal evidence (e.g., Bourdin & Fayol, 2002; Plimpton, 1965) suggests that the higher-level processes associated with content generation and structuring often in themselves make sufficient demands on cognitive resources to hamper progress. In children who have

* Corresponding author.
E-mail address: m.torrance@staffs.ac.uk (M. Torrance).

0959-4752/$ - see front matter © 2007 Elsevier Ltd. All rights reserved.
doi:10.1016/j.learninstruc.2007.02.003

yet to automate letter-formation and spelling, and who are less skilled in the more formal syntax that text requires, processing limitations can seriously constrain production. The lack of external prompts to assist with generating content and monitoring communicative effect means that writers also require sophisticated and explicit strategies for determining and structuring content (Burtis, Bereiter, Scardamalia, & Tetrse, 1983; Grabowski, 1996). It may be possible in some circumstances to generate content and structure in response to immediately available cues – the text of the assignment, for example. However, this ''knowledge-telling'' approach to writing (Bereiter, Burtis, & Scardamalia, 1988; Scardamalia & Bereiter, 1991) is likely to result in content-rich and rhetorically appropriate text only if the writer has sophisticated knowledge of both topic and genre. For students in intermediate grades, particularly when they are producing expository rather than narrative texts, this knowledge is likely to be absent. The texts that result from knowledge-telling in the absence of sophisticated content and genre knowledge are typically both short, or at least content-impoverished and, in Flower's (1979) term, ''writer-based''.

The resource-intensive and solitary nature of writing mean that the ability to produce coherent multi-sentence texts does not develop naturally, even once a child has mastered handwriting and spelling (Bereiter & Scardamalia, 1982; Graham & Harris, 1997a). There is general consensus that in addition to these low-level skills, successful text production requires the exertion of a high degree of deliberate executive control (Flower & Hayes, 1977; Hayes & Flower, 1980b; McCutchen, 1988; Scardamalia & Bereiter, 1991). Without this discipline, writers (a) run the risk of cognitive overload by allowing several resource-demanding sub-processes to run simultaneously, (b) are likely run out of things to say before they have properly explored the topic, and (c) are unlikely to take adequate account of the informational needs of the intended audience. The strategic skills necessary to avoid these problems are a subset of a broad collection of cognitive, behavioral, and motivational strategies that are often referred to collectively as self-regulation (e.g., Graham & Harris, 2000; Zimmerman & Risemberg, 1997). Developing these skills in a population of otherwise-competent writers should enable them to produce markedly better texts.

The focus of the research reported in this paper is, therefore, the effectiveness and teachability of cognitive self-regulation in developing writers. By cognitive self-regulation – a term used by Zimmerman and Risemberg (1997) – we mean, primarily, the strategies that writers adopt to preplan what they are going to write, and to review and edit output. There is experimental evidence that writers at this level who are required to outline before writing produce better quality text than controls who write without preplanning (e.g., Kellogg, 1990). Primary-age children, however, typically spend little or no time preplanning their text (De La Paz, 1999). Children's thinking about what to write tends to occur concurrently with production and is typically exclusively content-focused (Burtis et al., 1983; Scardamalia & Bereiter, 1985): Young writers plan so that they can tell what they know. As writers develop they tend both to spend more time in explicit planning and also to plan in different ways. More mature planning tends to be associated with the deliberate setting of rhetorical goals which inform both search for content and how this content is then organised on the page (Bereiter et al., 1988). The resulting ''knowledge-transforming'' processes, if informed by an appropriate understanding of the target audience, results in text that is tailored to the reader in a way that is not possible under the ''knowledge-telling'' strategies of less mature writers. The reflective processes associated with knowledge transforming do not typically emerge spontaneously in young writers. There is, however, some evidence that they can be taught (Scardamalia, Bereiter, & Steinbach, 1984).

Revision, as a distinct activity engaged in after substantial portions of text have been produced, is described by many experienced writers as a central and essential component of their composition processes (e.g., Green & Wason, 1982). However, as with preplanning, revision plays little part in the writing processes of young writers. Research reviewed by Fitzgerald (1987) suggests that revision is rare even at college level and that where changes are made they tend to affect only surface structure. Younger writers are capable of making deeper changes to their text when they are specifically instructed to revise after they have finished drafting (Chanquoy, 2001). However, a relatively high level of language ability appears to be necessary, even at college level, for these deeper or more global changes to benefit text quality (Perl, 1979; Wallace et al., 1996).

These findings suggest possible benefits from training developing writers to preplan and revise. This may both encourage an approach to writing that moves beyond knowledge-telling and help to distribute processing demands more evenly across the writing task. However, there are likely to be preconditions on the effectiveness of a particular intervention. It is possible for students to learn strategies but for these then to be applied in such a way as to have negligible or even negative effect on text quality (Graham & Harris, 1997b). The research briefly reviewed above suggests that both preplanning and revision need to be combined with content, linguistic, and rhetorical knowledge if they are to be effective. It is also important that cognitive strategies become embedded as procedural knowledge and

available for all writing tasks, rather than remaining as activities that are engaged in only in response to prompts administered by the teacher.

Interventions are therefore most likely to be successful if they combine strategy training with instruction focused on developing discourse knowledge, and where teaching methods move students towards autonomous application of both cognitive strategies and discourse knowledge to their own writing. Several ''package'' interventions (Zimmerman & Risemberg, 1997) have been designed that address this need for both procedural and discourse knowledge and these have proved successful in improving the writing of children with learning disabilities (e.g., Garcia & Arias-Gundin, 2004; Graham & Harris, 1993; Sexton, Harris, & Graham, 1998; for a comprehensive list and meta-analysis see Graham, 2006). Graham and Harris (1997b; Schunk & Zimmerman, 1997) pointed to the need to extend this research to mainstream educational settings and to non-learning-disabled populations. Evidence from the few studies that have evaluated interventions for developing planning and revision in this context suggests benefits for normally achieving writers in seventh and eighth grades (Danoff, Harris, & Graham, 1993; De La Paz, 1999; De La Paz & Graham, 2002; Englert, Raphael, Anderson, Anthony, & Stevens, 1991). Both De La Paz, and De La Paz and Graham found increases in holistic quality, word-length, text-length, and plan development after instruction based on the Self-Regulated Strategy Development model (Graham and Harris, 1993; Harris & Graham, 1996). De La Paz and Graham found that these benefits remained one month after the end of the intervention. By conducting research in the normal classroom and by avoiding the use of resources that are not typically available to classroom teachers this second study indicates benefits for cognitive-strategy instruction as part of day-to-day literacy training.

The present study aimed to build on existing understanding of the effects of cognitive self-regulation instruction (CSRI) in two respects. First, by combining online measures of writing processes with fairly detailed text analyses we aimed not just to determine whether CSRI results in improved text but also explore the nature of its action. This seems particularly important given the multifaceted nature of this kind of intervention. Because the cognitive processes associated with planning and revision are taught in conjunction with discourse knowledge – students are necessarily not only taught *how* to plan but also *what* to plan – it may be that improvements to text quality result from an increased rhetorical repertoire rather than from cognitive self-regulation per se. (In the present study we also address this question by exploring whether the effects of CSRI, taught exclusively using example from one expository genre, transfer to performance on different kinds of writing task.) It is also possible that students will go through the motions of planning and revising without this impacting text quality. This is perhaps more likely with less mature writers and so a particular concern in the present study which focused on students who were somewhat younger than those who studied by De La Paz and Graham (2002).

Braaksma and co-workers (Braaksma, Rijlaarsdam, & van den Bergh, 2002; Braaksma, Rijlaarsdam, van den Bergh, & van Hout-Wolters, 2004) asked eighth grade writers to think aloud while producing texts prior to and following training based on observation and then emulated experienced of writers. They found increases in both the extent to which participants engaged in higher-level (regulated) cognitive activities and in the quality of their texts. To our knowledge this is the only previous study involving online process measures of the effects of writing training for young writers. In the present study we used time-sampled self-report instead of think aloud, a method adopted by previous studies of adult writers (e.g., Kellogg, 1988; Torrance, Thomas, & Robinson, 1999) although not, to our knowledge, with primary-aged children. There is some evidence that obtaining writing-process measures in this way is less reactive than think-aloud methods (Piolat & Olive, 2000) and this is likely to be particularly true for younger writers.

The second aim of our research was to extend understanding of the effects of CSRI to participants who were both younger and from a different language group and educational culture than those typically studied in previous intervention evaluations. Writing development results from a complex interaction between endogenous (cognitive-developmental) and exogenous (instructional) factors (Berninger, Fuller, & Whitaker, 1996). It therefore seems important to ask whether strategy instruction that is effective for seventh and eighth grade students studying in North American schools is also effective for sixth-grade students who have grown up within a different educational system.

The present study therefore explored the effects of a 10-session classroom-based CSRI program designed to teach strategies for preplanning and substantive revision and encourage their use by young (sixth grade), non-learning-disabled, Spanish writers. The central questions we address are (a) whether an intervention with this focus is capable of developing strategies for cognitive self-regulation for writers of this age, (b) whether they are then able to use them to improve the quality of their text, and (c) whether the effect of the intervention on text quality, if any, is mediated by effects on strategy.

2. Method

2.1. Participants and educational context

Our sample comprised 95 sixth-grade Spanish primary students (39 girls and 56 boys) with a mean age of 11 years and 7 months, ranging from 131 months to 155 months. These students were taken from four different classes. Three of these classes were within the same school, and these students ($n = 71$) formed the CSRI group. The fourth class was from a different school and these students ($n = 24$) formed an ordinary-curriculum control. Sample and testing details are summarised in Table 1. No participants were diagnosed with general or specific learning disabilities and all had Spanish as their first language. There was no significant student absence during the intervention period in either the CSRI or normal-curriculum conditions.

The schools were closely matched demographically, drawing on middle-class suburban native-Spanish populations. Both schools were semi-private religious foundations (*concertados*) with overall academic attainment slightly higher than is typical for wholly state-funded Spanish primary schools. Educational infrastructures (student-teacher ratio, resources and so forth) were also closely matched between the two schools.

All participants had received similar forms of writing instruction in their educational career prior to this research. At grade six Spanish language teaching in all Spanish state schools focuses on different genres (narrative, letters, expository text, and so forth). In this and earlier stages there tends to be a strong emphasis on teaching rules for correct spelling and grammar, and a particular focus on neat presentation. Teaching in the months prior to the study for students in our sample involved cycles of the teacher introducing specific genres, the students writing texts in this genre, and the teacher correcting these for grammar, spelling, and presentation. This form of instruction continued for the ordinary-curriculum group throughout the study period, and reverted to this form for the CSRI group immediately after the end of training.

2.2. Training

Recent research suggests that a combination of observation and scaffolded emulation is effective in fostering self-regulatory practices in developing writers (Braaksma et al., 2004; Englert, 1992; Graham, Harris, & Troia, 2000; Harris & Graham, 1992; Schunk & Zimmerman, 1997; Zimmerman & Kitsantas, 2002). In the interventions described by these authors students first observe and then emulate a competent writer engaged in the target strategy. Emulation is accompanied by feedback on their performance from the teacher and/or from peers. The ultimate aim is to develop students who regulate their own performance without the need for teacher support. This combination of observation and emulation with social feedback has been shown to be effective in developing revising strategies and improving text structure in writers with learning difficulties (Graham, Macarthur, & Schwartz, 1995; Sawyer, Graham, & Harris, 1992), and to be more effective than direct-teaching methods in training college students in a sentence-combining task (Zimmerman & Kitsantas, 2002) and in developing planning and rereading strategies in eighth grade writers (Braaksma et al., 2004).

Instruction in the present study followed this model with teaching of each cognitive-strategy proceeding through four stages. First the instructor, an experienced Spanish language teacher, used direct-teaching methods to present an overview of the strategy to be learned. This provided students with a framework and vocabulary for interpreting

Table 1
Summary of design and sample characteristics

Class	I	II	III	IV
N (male, female)	22 (m 13, f 9)	24 (m 17, f 7)	25 (m 10, f 15)	24 (m 16, f 8)
Mean age (months)	140	139	139	139
Baseline task (topic)	Compare–contrast (A)	Compare–contrast (A)	Compare–contrast (A)	Compare–contrast (A)
Training	Cognitive self-regulation	Cognitive self-regulation	Cognitive self-regulation	Ordinary curriculum
Post-test task (topic)	Compare–contrast (B)	Compare–contrast (B)	Compare–contrast (B)	Compare–contrast (B)
Post-training instruction	Ordinary curriculum	Ordinary curriculum	Ordinary curriculum	Ordinary curriculum
Twelve week post-test task (topic)	Compare–contrast (C)	Opinion (D)	Cause–effect (E)	Compare–contrast (C)

subsequent modelling. The teacher then modelled the strategy by composing text in front of the students and concurrently vocalizing her thoughts. Initially she provided a coping model, presenting a less-than-perfect use of the strategy but promptly addressing and correcting errors. The teacher then progressed to a mastery model, using the target strategy flawlessly. Finally, students emulated the teacher's performance by writing their own texts and vocalizing their thoughts. The teacher and, subsequently, peers listened to these vocalizations and provided feedback.

The CSRI program comprised 10 weekly sessions each lasting between 60 and 75 min, and several homework tasks. Over these sessions the students completed a total of five expository essays, all in a compare–contrast genre. The first session aimed to motivate students by focusing on the communicative function and importance of writing and by making a case for developing ability in the process of writing, rather than just knowledge of the finished product. The next session gave direct and interactive instruction in the different functions of planning, following Hayes and Flower (1980a), and focused separately on setting rhetorical goals, collecting and generating content, and developing structure. Instruction in preplanning was supported by two devices. Students were taught the mnemonic OAIUE: Objective (*objective*) – what is purpose of the text? Audience (*audiencia*) – for whom is it intended? Ideas (*ideas*) – what ideas might be included? Organisation (*uno*) of ideas – what are the main and subordinate points? Schema (*esquema*) – what generic form might the text take? Idea generation was supported by asking students to complete an empty table with columns for ideas relating to ''what'', ''how'', ''when'', and ''why''.

During the third session the teacher modelled strategies that perform these functions by thinking aloud while planning a text. Thinking aloud was partly spontaneous, but also included specific self-regulatory statements that the teacher had previously been trained to include in what she said (e.g., *What is the first thing that I must do? … Now I must remember the ''five vowels'' planning strategy … What is the goal of my text? … Are there enough ideas?*). Following this session students were asked, as a homework exercise, to emulate the teacher's planning. They submitted both written plans and written commentary on the processes in which they had engaged. The teacher then provided feedback on the extent to which they had used appropriate planning strategies.

Sessions four to seven taught strategies for revision. The fourth session gave direct and interactive instruction in the role and importance of reviewing and editing. This session also explicitly suggested three features that students might want to look for and improve in their own texts: whether the structure of the text matches its genre, whether paragraphs are used effectively, and use of coherence ties. Issues about text structure were discussed with reference to the typical organisation of compare-and-contrast essays. Session five and the related homework task followed the same pattern as session three, but with an emphasis on revision. Sessions six and seven provided direct instruction on revision, with a focus on the distinction between surface level revision and revision of deep structure, and further observation and emulation. Instruction on revision was supported with the mnemonic LEA: read (*lee*) the text; Evaluate (*evalúa*) the text, supported by a list of different kinds of surface and deep revision (e.g., correcting spelling errors; finding additional evidence to support and argument); Act (*actúa*) – make the necessary changes).

The final three sessions and accompanying homework tasks involved observation and emulation of the range of self-regulatory strategies introduced in previous sessions. In the eighth session the teacher thought aloud while preplanning, writing, and revising an essay and the students emulated this, with a different topic, as a homework task. In session nine, students worked in pairs, each observing and commenting while the other preplanned, drafted, and revised, thinking aloud throughout. The teacher provided additional commentary. In the last session students worked alone, again with commentary from the teacher, and finally produced their own list of self-regulatory statements.

The intervention used in this study was in most respects very similar to the Self-Regulated Strategy Development approach (SRSD; Harris & Graham, 1996) which has been used extensively in previous evaluations of strategy-based writing instruction. Like SRSD the present intervention aimed at a progression from delivering declarative knowledge about a particular skills or procedure, through teacher modelling and collaborative practice, to a point where students have achieved procedural mastery and are therefore capable of independently applying strategies to their own writing. Differences between the present intervention and the ways in which SRSD has typically been implemented were mainly associated with adaptation for use with normally competent students. Our intervention therefore involved more extensive emulation of writing processes without direct teacher oversight, both with peers and as homework tasks, than has typically been the case in SRSD studies. We use the CSRI acronym in this paper simply to indicate a general approach to writing instruction that would embrace SRSD and other interventions that aim to develop independent mastery and use of cognitive strategies. It is not intended to denote a specific alternative approach to writing-process instruction.

2.3. Implementation

CSRI was administered in the context of the students' normal Spanish language classes, starting half way through the academic year, and was delivered by the students' normal Spanish language teacher. In Spanish primary schools different subjects are taught by different teachers and so training was delivered by the same teacher to all three classes that comprised the CSRI group. Prior to the study, the teacher attended several training sessions during which the aims and methods of CSRI were explained. One of the researchers (RF) also met with the teacher on a weekly basis during the intervention period to go over the details of that week's program. The timing of these meetings was arranged so as to counterbalance order of delivery to the three different classes (i.e. we systematically varied which class was taught first after the teacher-training meeting) thus eliminating possible teacher-practice effects.

We checked that training had been conducted appropriately in two ways. First, at the start of each of these meetings the researcher interviewed the teacher about her practice and experience from the previous week. Second, portfolios of students work, comprising all text, plans and commentaries generated during training were collected at the end of the program and were studied to ensure that all students had completed all tasks appropriately. Evidence from teacher interviews and portfolios converged to suggest that the training was delivered correctly and that students were able to complete the tasks.

2.4. Ordinary-curriculum control

Students in the ordinary-curriculum comparison group spent rather longer in writing-related lessons during the intervention period, averaging between 80 and 100 min per week. All classes were taught by a single teacher and, as with the CSRI group, this was the students' normal Spanish language teacher who had already taught them for the previous 4 months of that academic year. This teacher was not the same person as delivered training in the CSRI condition. Over the 10 week period students completed five expository writing tasks in a range of genres and several non-expository tasks. Instruction associated with each of these tasks followed a pattern that, as we indicated above, is common in Spanish writing instruction. Lessons were organised as follows. First the teacher talked about the particular structural characteristics that are typical of texts in the genre in which the students were to write. Second, students read one example of that kind of text. Third, students wrote their own texts, sometimes referring to a style text-book for guidance. This was completed either in class or for homework. Finally, the teacher corrected students' texts, marking them for organisation, breadth of content, grammar, spelling, and the presence of the required structural features. The students did not revise their texts in the light of the teacher's feedback. Teaching time was also devoted to teaching spelling, grammar, and vocabulary, independently of specific writing tasks. The students did not receive any process-oriented or cognitive-strategy instruction. Hillocks (1984) conducted an early meta-analysis of evaluations of different forms of writing instruction. In his term, the model of instruction in the normal-curriculum control group might be characterised as ''presentational'' with the instruction focussing on a combination ''models'' and ''grammar and mechanics''.

2.5. Evaluation

2.5.1. Design

Effects of CSRI were evaluated using the experimental design summarised in Table 1. Students in the CSRI group completed writing tests immediately prior to the intervention (baseline), immediately following the intervention (post-test), and again 12 weeks after completion of the intervention (delayed post-test). Students in the ordinary-curriculum condition completed the same tasks at closely matched times. Writing tests involved students composing short expository essays whilst logging their writing activities at regular, random intervals. At baseline and post-test all participants wrote essays in the same genre (''compare and contrast'' – the same genre as was the focus of the training in the CSRI condition). To determine whether the effects of CSRI generalised to other kinds of expository task at delayed post-test the three different classes that comprised the CSRI group completed tasks in different genres. Class I completed a compare–contrast task (the same task as the ordinary-curriculum group, $n = 22$), Class II completed a task that involved expression of an opinion ($n = 24$), and Class III completed a task involving description of a causal relationship ($n = 25$).

2.5.2. Writing tasks

All writing tasks involved topics that were related to subjects covered in the students' fifth grade curriculum. For pedagogic reasons topics were not counterbalanced across time-of-testing, but were matched for complexity of content and extent of coverage in previous teaching. At baseline students in both control and CSRI groups wrote about the similarities and differences between demonstratives and possessives (Topic A in Table 1). At post-test both groups wrote about the similarities and differences between vertebrates and invertebrates (Topic B). At delayed post-test, the ordinary-curriculum group and the Class I in the CSRI group wrote about the similarities and differences between mammals and birds (Topic C), students in Class II wrote an opinion essay about pollution (Topic D), and students in Class III wrote a cause-and-effect essay about pollution and environmental damage (Topic E). Comparison among Classes I, II, and III therefore allowed evaluation of the extent to which longer term effects of the intervention generalised to different expository genres.

For all tasks students were provided with reference sheets (approximately 500 words of text) providing topic-relevant information. Students were told that they should write full prose and not just lists of ideas, that they should write to the best of their ability because the resulting essay would be seen by their teacher and compared with essays by students from other parts of the country, and that they were free to use the reference materials and their own ideas as they wished. Students did not write to a strict time limit. All tasks were introduced and administered by one of the authors (RF).

2.5.3. Process measures

Participants were given a blank writing log divided into multiple sections each listing seven possible writing activities, reduced from a longer list used with adult writers by Torrance, Thomas, and Robinson (1999). These were labeled and defined as follows: *Reading references* – reading information and data about the topic; *Thinking about content* – thinking about things to say in the essay; *Writing outline* – making a scheme or notes about the essay that I am going to write; *Writing text* – writing my essay; *Reading text* – reading through part or all of my text; *Changing text* – making changes to my writing (correcting spelling mistakes, changing words, adding words…); and *Unrelated* – doing or thinking something unrelated to the text (talking to my partner, looking for a pen, looking through the window…). While performing the writing task students heard a 1-s tone played at random intervals of between 60 and 120 s, with a mean interval of 90 s. On hearing the tone students were instructed to respond by indicating in the writing log the activity in which they were currently engaged. It was stressed that they should report only the activity in which they were engaged at precisely the time that the tone sounded and not their main activity since the previous tone. These activities were marked in the writing logs by simple graphics so as to minimize the extent to which completing the log diverted attention from the writing task.

Students were trained in using this method prior to completing the baseline assessment. At the start of the baseline testing session students were presented with names and definitions for the seven categories of action used in the self-report task. Each was illustrated with several examples and counter-examples. Students then practiced using the scheme by watching video-taped examples of writers thinking aloud. Immediately before completing each writing task students were reminded of the seven action definitions and were again encouraged to report only the activity that was occurring at the moment the tone sounded.

We determined students' accuracy in using the categorization scheme after initial training by playing a videotape of a writer thinking aloud whilst planning and drafting text and asking students to indicate the writer's activity at each of 25 different points. Comparing students' categorization with that of an expert judge showed a mean agreement of .89 (kappa = .87) with by-category agreement varying from .88 for *writing text* to .92 for *reading text.*

2.5.4. Product measures

The quality of the completed texts was assessed in terms of both informal, reader-based criteria, and by more formal text-based methods based on counts of the linguistic features that increase the likelihood that readers will perceive a text as coherent.

Reader-based assessment comprised measures for structure, coherence, and general quality described by Spencer and Fitzgerald (1993). *Structure* was assessed on a four point scale from 1 = unstructured to 4 = well structured. Ratings were based on the extent to which readers perceived that the text included (a) background information introducing the text, (b) cues indicating text structure, (c) an introductory topic or thesis sentence, (d) clear organisation of ideas

based around a definite scheme, (e) unity of theme within paragraphs and across the whole essay, and (f) a conclusion that reiterated the purpose of the paper.

Coherence was also assessed on a four point scale, from 1 = incoherent to 4 = very coherent with ratings based on the extent to which the reader perceived that (a) a topic or theme was identified and remained a focus for the essay, (b) the text included a context that orientated the reader, (c) information was organised in a discernible pattern which was sustained through the text, (d) sentences and paragraphs were cohesively tied, and (e) the discourse flowed smoothly.

Quality was assessed on a six point scale from 1 = difficult to understand to 6 = excellent with ratings based on the extent to which the text demonstrated (a) a clear sequence of ideas, with little or no irrelevant detail, (b) clear organisation, (c) fresh and vigorous word choice, (d) varied and interesting detail, (e) correct sentence structure, and (f) accurate punctuation, capitalization and spelling. These criteria were varied slightly from those used by Spencer and Fitzgerald to make them appropriate for expository text and to accommodate the three different genres of the delayed post-test writing tasks, based on guidelines suggested by Sorenson (1997).

Two readers, working independently and blind to experimental condition, each rated all of the texts. We found interrater agreement (Pearson *r*) of .73 for structure, .74 for coherence, and .86 for quality. Disagreements were resolved by averaging across raters.

Text-based measures included paragraph and word counts, recording whether or not texts included introductory and concluding paragraphs, and counts of seven different linguistic indicators of coherence. Linguistic devices that promote coherence can be thought of as functioning to tie different components of the text (principally sentences and paragraphs) together. Ties can be either referential or relational (Halliday & Hassan, 1976; Sanders, Spooren, & Noordman, 1992). Reference ties involve either *anaphoric* reference (*Peter is a young man. He likes playing football.*) or direct repetition of *lexical* items (*Peter is a young man. Peter likes playing football.*). Our analysis of relational ties was based on a classification by Bosque and Demonte (1999) and involved counting specific linguistic markers. *Metastructural ties* are marked by phrases that explicitly signpost the text that followed (*Now I will describe…, The following paragraph talks about…*). *Structural ties* involve markers that indicate sequencing in the text (*first, second, … , finally* ; *later*, *afterwards*, *eventually*). *Connective ties* are marked by *and*, *also*, *as well as*, and so forth. *Reformulation ties* involve summarization or reiteration of a point in a different form and are marked by phrases such as *in conclusion*, *that is to say*, and *in other words*. Finally, *argumentational ties* relate to the use of evidence and other devices for persuading the reader (marked by *for example*, *however*, *despite this*, and so forth).

Scores for these various coherence measures were all based on counts of specific linguistic markers (or for lexical ties, of repeated noun-phrases) and it was often the case that several of these markers were present in one sentence. All texts were analyzed by two trained judges. Mean interrater correlation (Pearson *r*) across all seven categories was .97, with agreement of .85 for anaphoric ties and of more than .95 for all other categories.

The number of cohesion ties within a text is clearly dependent in part on its length. To control for this rather than presenting simple counts of cohesion ties, we report *tie density* calculated as the number of ties per 100 words of text.

3. Results

Training affected both the processes by which students produced their texts and the nature of the finished product. In describing these findings we will first detail effects on process, derived from an analysis of the participants' writing logs, and then effects on product derived from analysis of completed texts. Finally, we will describe process–product relationships.

3.1. Effects on process

Time spent in each of the seven activities was estimated by multiplying the number of times that a participant indicated a particular activity in their writing log by the mean inter-tone interval (1.5 min). Findings are summarised in Table 2. Distributions for both time-in-activity and time-in-activity expressed as a percentage of total time-on-task were substantially positively skewed for all activities. However, change scores (differences between time-in-activity at post-test or delayed post-test and time-in-activity at baseline) were distributed normally. Because of this analysis was in two stages. We first determined whether differences between ordinary-curriculum and CSRI groups in change-from-baseline were reliable, using parametric tests. Effect size (*d*) is reported for this comparison, calculated as the difference in means between normal-curriculum and CSRI groups divided by the standard deviation for the

Table 2
Estimated mean time in minutes and estimated percentage of total time spent in different activities whilst writing trial essays prior to, immediately after and twelve weeks after cognitive self-regulation instruction (CSRI) and at matched times in the ordinary-curriculum control

	Baseline		Post-test		Delayed post-test			
	Ordinary curriculum	CSRI	Ordinary curriculum	CSRI	Ordinary curriculum	CSRI		
						Compare–contrast	Opinion	Cause–effect
Estimated time (min)								
Reading references	1.25 (.72)	1.69 (1.41)	2.56 (1.74)	3.4 (2.55)	2.25 (1.66)	2.25 (1.72)	3.19 (1.94)	3.72 (2.42)
Thinking about content**/*	.81 (.76)	1.39 (1.44)	.75 (1.33)	4.25 (4.14)	1.06 (1.43)	3.07 (3.57)	2.19 (2.17)	2.64 (3.39)
Writing outline**/**	.25 (.57)	.38 (1.36)	.5 (.96)	8.98 (6.85)	.69 (.99)	6.34 (6.99)	3.13 (3.95)	8.88 (6.29)
Writing text**/**	4.00 (2.79)	4.86 (2.78)	8.94 (3.92)	14.5 (6.16)	7.63 (3.67)	21.41 (5.07)	15.06 (4.95)	18.36 (8.75)
Reading text*/*	1.13 (1.01)	1.46 (1.39)	.81 (1.08)	2.28 (2.52)	.56 (.97)	1.43 (2.15)	1.69 (1.79)	2.28 (2.04)
Changing text	.63 (.76)	.99 (1.36)	.63 (.98)	1.71 (2.16)	.81 (1.17)	.89 (1.10)	2.44 (3.18)	1.50 (2.17)
Unrelated**/ $^{-}$	.06 (.31)	.51 (.91)	.13 (.42)	2.32 (2.19)	.50 (.72)	1.36 (1.90)	1.88 (1.55)	.84 (1.15)
Total time-on-task**/**	8.42 (3.15)	11.4 (3.85)	14.7 (5.31)	37.7 (9.09)	13.8 (4.92)	37.1 (5.35)	29.8 (4.84)	38.5 (8.00)
Percentage of total time								
Reading reference materials*/**	16.7 (11)	15.7 (13.2)	17.6 (1.6)	9.1 (6.6)	16.4 (1.3)	6.2 (4.8)	10.8 (6.9)	9.6 (5.6)
Thinking about content	10.1 (1.7)	12.8 (12.1)	4.3 (7.9)	11.2 (9.9)	7 (8.8)	8.2 (9.0)	7.2 (7.0)	6.6 (7.8)
Writing outline**/ $^{-}$	2.3 (5.4)	2.8 (8.1)	3.0 (5.4)	23.3 (16.5)	5.3 (8)	16.2 (16.9)	9.9 (11.2)	23.9 (17.5)
Writing text**/ $^{-}$	49.6 (21.5)	42.9 (17.9)	63.4 (16.9)	38.7 (13.5)	57.6 (2.3)	59.2 (14.6)	51.8 (17.4)	47.7 (19.4)
Reading text	13.8 (12.5)	12.8 (11.4)	6.5 (8.9)	6.5 (7.2)	4.4 (7.8)	3.8 (5.4)	5.8 (6.0)	5.9 (5.0)
Changing text	6.8 (8.9)	8.4 (1.5)	4 (6.4)	4.8 (5.8)	5.6 (8.3)	2.5 (3.1)	8.1 (10.8)	3.6 (4.9)
Unrelated*/ $^{-}$	.6 (2.9)	4.6 (8.2)	1.3 (4.6)	6.5 (6.3)	3.7 (5.6)	3.9 (6.0)	6.5 (5.6)	2.5 (3.7)

Notes: Standard deviations are shown in parentheses. *$p < .05$, **$p < .005$ for differences between CSRI and normal-curriculum control in change-from-baseline. Statistical significance is indicated first for baseline/post-test differences, and then for baseline/delayed post-test differences for just those participants who completed the compare–contrast task at delayed post-test.

normal-curriculum group. Where significant differences were found we then looked for reliable differences between baseline and post-test or delayed post-test scores, conducting these analyses separately for ordinary-curriculum and CSRI groups using distribution-free tests (Wilcoxon Signed Ranks tests, giving Z as the test statistic). For the CSRI group, comparisons between baseline and post-test involved all three classes (Classes I, II, and III; $n = 71$) but comparisons between baseline and delayed post-test involved just those students who completed compare–contrast tasks at both of these times (Class I, $n = 22$). Finally, we explored whether effects at delayed post-test generalised to different genres (Classes II and III).

3.2. Total time-on-task

Both CSRI and ordinary-curriculum groups wrote for longer during the post-test writing task than at baseline (for ordinary-curriculum group, $Z = -3.91$, $p < .001$; for CSRI group, $Z = -7.33$, $p < .001$), but the increase was substantially greater in the CSRI condition, with children writing for, on average, more than three times longer after CSRI ($t(93) = 11.17$, $p < .001$, $d = 4.07$, for differences between groups in change-from-baseline). This pattern remained at delayed post-test. (Difference between groups in change-from-baseline, $t(44) = 13.17$, $p < .001$, $d = 4.33$. Differences between baseline and delayed post-test score: ordinary-curriculum group, $Z = -3.81$, $p < .001$; CSRI group, $Z = -4.11$, $p < .001$).

3.3. Outlining

The increase in total writing time for the CSRI group was due most noticeably to an increase in time spent outlining. Preplanning of text was largely absent prior to CSRI with only 11 (15%) of the CSRI group and 4 (16%) of the ordinary-curriculum group reporting outlining at any stage in their writing process. Training had substantial effects on this, however, with CSRI participants devoting, on average, 23% of their post-test writing time to outlining. There was no similar increase for the ordinary-curriculum group. (Difference between groups in change-from-baseline, $t(93) = 5.2$, $p < .001$, $d = 2.57$. Differences between baseline and post-test score: ordinary curriculum, $Z = -1.1$, n.s.; CSRI, $Z = -6.9$, $p < .001$.) There was some evidence of a rejection of outlining at delayed post-test with 16 (73%) of the CSRI group reporting outlining, compared with 20 (92%) for the post-CSRI task. However, CSRI participants continued to devote substantially more time to outlining than they had done prior to the intervention. (Difference between groups in change-from-baseline: $t(44) = 3.26$, $p = .002$, $d = 4.26$. Differences between baseline and delayed post-test score: ordinary curriculum, $Z = -1.7$, n.s.; CSRI, $Z = -3.01$, $p = .003$.)

3.4. Thinking about content

This category of activity was intended to capture relatively unregulated planning, and therefore contrasts with outlining which is a regulated and ordered approach to developing content and structure. There was a statistically significant increase in time spent thinking about content as a result of CSRI. (Difference between groups in change-from-baseline, $t(93) = 3.37$, $p = .001$, $d = 2.04$. Differences between baseline and post-test score: ordinary curriculum, $Z = -.43$, n.s.; CSRI, $Z = -5.25$, $p < .001$.) However, thinking about content engaged a roughly similar proportion of the CSRI group's total time-on-task at baseline and at post-test. A similar pattern remained at delayed post-test (difference between groups in change-from-baseline, $t(44) = 2.09$, $p = .043$, $d = 1.21$. Differences between baseline and delayed post-test score: ordinary curriculum, $Z = -.77$, n.s.; CSRI, $Z = -2.3$, $p = .02$).

3.5. Reading references

There were no statistically significant effects of the intervention on time spent reading reference materials, either at post-test or delayed post-test. The proportion of total writing time spent in this activity remained roughly constant across time-of-testing for the ordinary-curriculum group, but showed a significant decrease at both post-test and delayed post-test for the CSRI group (baseline vs post-test $Z = -3.2$, $p = .001$; baseline vs delayed post-test $Z = -3.4$, $p = .001$).

3.6. Reading text

There was less evidence that CSRI increased participants' tendency to revise their text. Prior to CSRI, 15 (62%) of the ordinary-curriculum group and 47 (66%) of the CSRI group reported reading the text that they had written, and these proportions remained roughly similar for the post-test task (10 (42%) and 44 (62%) for ordinary-curriculum and CSRI groups, respectively). There was some evidence of an increase in amount of time spent reading text as a result of CSRI. (Difference between groups in change-from-baseline, $t(44) = 2.74$, $p = .009$, $d = 1.4$.) Differences between baseline and delayed post-test score: ordinary curriculum $Z = -1.18$, n.s.; CSRI $Z = -2.64$, $p = .008$. However, these differences were relatively slight, and in fact represented a decrease in proportion of total time-on-task for the CSRI group. This pattern remained at delayed post-test.

3.7. Changing text

Across all students, changing text was a relatively rare activity, engaged in at baseline by 10 (42%) of ordinary-curriculum students and 33 (46%) of CSRI students. There was a slight increase in the number of CSRI students who reported changing text at post-test (ordinary curriculum, 8 (33%); CSRI, 40 (56%)) but this effect disappeared at delayed post-test (ordinary curriculum 10 (42%), CSRI Class I 10 (45%)). The amount of time spent changing text therefore showed a slight increase at post-test for the CSRI group but not for the ordinary curriculum, and the difference between groups in change-from-baseline did not reach statistical significance. (Difference between groups in change-from-baseline, $t(93) = 1.6$, n.s. Differences between baseline and delayed post-test score: ordinary curriculum, $Z = 0$; CSRI, $Z = -2.86$, $p = .004$.) There was no evidence of any remaining effect of CSRI on time spent changing text at delayed post-test.

3.8. Writing full text

Mean time spent writing full text, as opposed to planning or revising, increased substantially as a result of CSRI ($Z = -7.30$, $p < .001$). This did not, however, represent an increased proportion of total time. There was also an increase for the ordinary-curriculum condition, although this was smaller ($Z = -4.2$, $p < .001$). Change-from-baseline was significantly greater for the CSRI group ($t(93) = 3.76$, $p < .001$, $d = .78$). The increase in time spent writing full text remained at delayed post-test with again with both ordinary-curriculum and CSRI groups spending more time than at baseline in this activity (ordinary curriculum, $Z = -3.28$, $p = .001$; CSRI, $Z = -4.11$, $p < .001$) but the CSRI group showing a greater change-from-baseline ($t(44) = 10$, $p < .001$, $d = 3.34$). There was evidence of an increase between post-test and delayed post-test in time spent writing for just the CSRI group (ordinary curriculum $Z = -1.59$, n.s.; CSRI $Z = -2.71$, $p = .007$). However, expressed as a proportion of total time-on-task, the CSRI group showed a slight decrease in writing full text which contrasted with an increase for the ordinary-curriculum group (difference between groups in change-from-baseline, $t(93) = 3.76$, $p < .001$, $d = .78$).

3.9. Transfer to other genres

At delayed post-test the effects of CSRI generalised well to the two other genres. Students writing both opinion essays (Class II) and cause-and-effect essays (class III) spent significantly more time outlining during the delayed post-test than at baseline ($Z = -3.34$, $p = .001$ and $Z = -3.92$, $p < .001$ for, respectively, Class II and Class III). Time spent writing and total time-on-task were also substantially and significantly greater for these groups than for the ordinary-curriculum group. The opinion essay, however, was completed more quickly than the other two tasks ($F(2,68) = 13.3$, $p < .001$ $\eta^2 = .28$, for a one-way ANOVA comparing just the CSRI groups; data were not skewed). There was also an effect of genre on outlining time ($\chi^2(2) = 1.2$, $p = .006$ for a Kruskal–Wallis one-way ANOVA), with less time spent outlining opinion essays than for the other two tasks.

3.10. Summary of process effects

In summary, CSRI appeared to have a substantial effect on the extent to which participants engaged in self-regulated planning strategies. These effects remained three months after the end of the intervention, and generalised to different

writing genres. CSRI had a much more limited effect on the extent to which students revised their text. These patterns can clearly be seen in the time-course graphs shown in Fig. 1. Writers prior to CSRI tended to launch into the production of full text right at the start of the writing process. After CSRI initial stages of the writing process tended to be dominated by outlining, with writing full text only becoming a major focus around half way through the task. Outlining remained central to writing processes in the delayed post-test, but writers appear typically to have finished outlining and started writing full text rather earlier (in proportion to overall time-on-task) than was the case in the post-test. For comparability, Fig. 1 plots data from just those students who produced texts in the same genre in all three trials (Class I). We observed similar patterns in the classes that wrote in different genres at delayed post-test. Normal-curriculum group participants gave very similar process time-course profiles at baseline, post-test and delayed post-test.

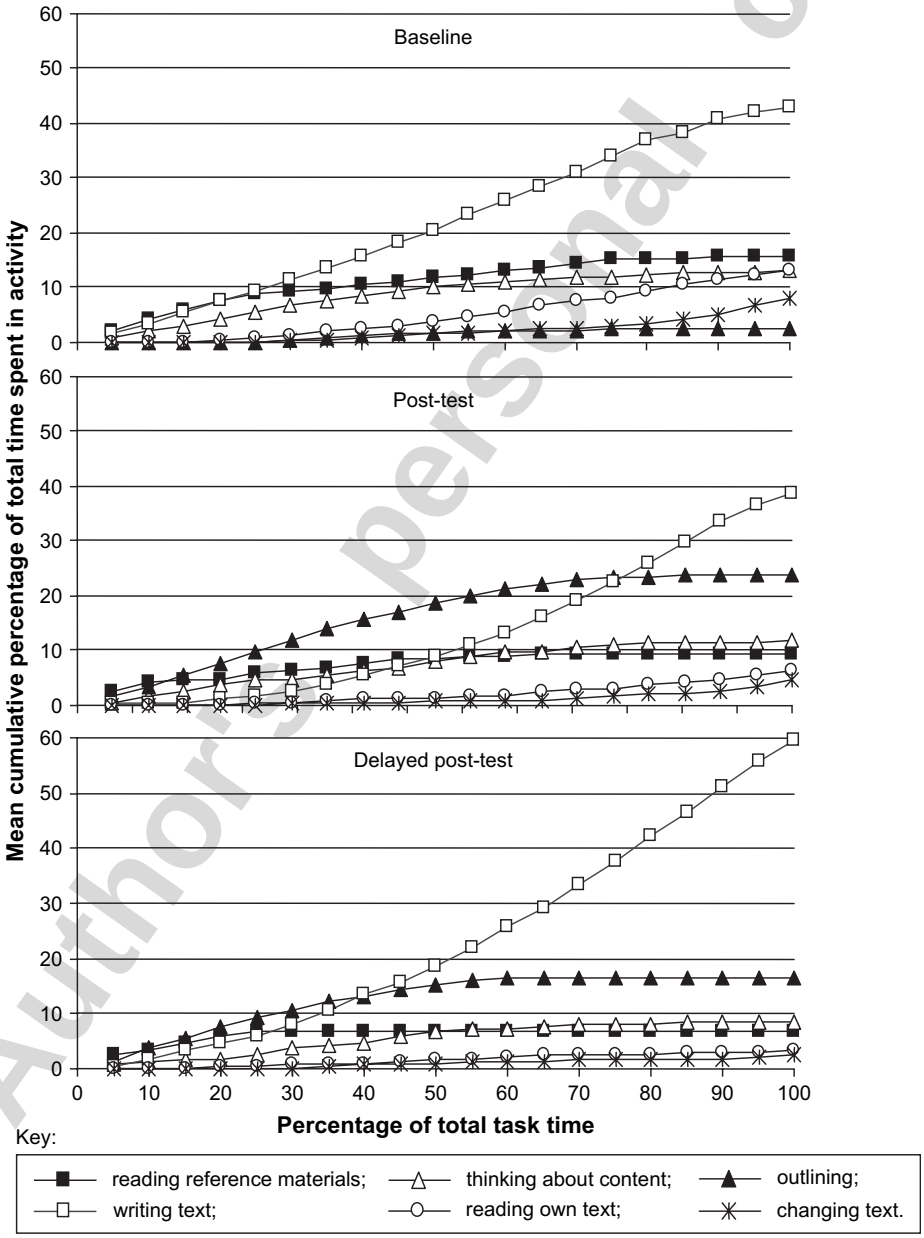

Fig. 1. Writing time-courses prior to and following cognitive self-regulation instruction (CSRI). Note: Curves plot the estimated mean cumulative percentage of total writing time in specific activities against percentage of total time-on-task. Data are from the writing logs of students in the CSRI who completed compare–contrast tasks at baseline, post-test and delayed post-test (class I, $n = 22$).

3.11. Effects on completed texts

Texts were analyzed for length, for readers' evaluation of quality, for linguistic devices associated with coherence, and for various structural features. Findings are summarised in Table 3. As in the previous section, for the CSRI group comparison between baseline and post-test scores is based upon data from all three classes ($n = 71$) and comparison between baseline and delayed post-test scores is based upon just those students who completed the compare–contrast task at delayed post-test (Class I, $n = 22$). ANOVAs were conducted separately for baseline versus post-test and for baseline vs. delayed post-test. F-ratios are, in all cases, from 2 (group) by 2 (trials) mixed-design ANOVAs and represent the effect of the interaction between group (ordinary curriculum vs. CSRI) and trial (either baseline vs. post-test or baseline vs. delayed post-test).

3.12. Length

There was a slight and statistically non-significant increase in the number of words that CSRI participants wrote for the post-CSRI task compared with baseline. CSRI participants produced orthographic sentences (defined as strings starting with a capital letter and ending with a full stop) with roughly similar mean lengths prior to and following the intervention. There was a substantial increase in the use of paragraphing post-CSRI that was not present in the ordinary-curriculum group ($F(1,93) = 26.0$, $p < .001$, $\eta^2 = .22$ for number of paragraphs written). This was to some extent independent of the increase in overall length: Mean paragraph length for the CSRI group at baseline was 56.1 words (SD = 31.3) which decreased to 27.7 words (SD = 11.9) post-CSRI, with no similar change in the ordinary-curriculum group ($F(1,93) = 6.07$, $p = .02$, $\eta^2 = .06$).

At delayed post-test the effect of CSRI on word count was more pronounced with the group × trials interaction reaching significance ($F(1,44) = 7.16$, $p = .01$, $\eta^2 = .14$), and the CSRI group continued to paragraph extensively and significantly more than the ordinary-curriculum group ($F(1,44) = 44.9$. $p < .001$). The effect of CSRI on paragraph length was, however, absent.

Table 3
Reader-based and text-based evaluations of students' texts prior to, immediately after and 12 weeks after cognitive self-regulation instruction (CSRI) and at matched times in the ordinary-curriculum control

	Baseline		Post-test		Delayed post-test			
	Ordinary curriculum	CSRI	Ordinary curriculum	CSRI	Ordinary curriculum	CSRI		
						Compare–contrast	Opinion	Cause–effect
Reader-based measures								
Quality[a]**/**	2.46 (.55)	2.40 (.60)	2.21 (.25)	5.29 (1.06)	2.17 (.50)	4.91 (1.11)	4.15 (1.13)	4.86 (1.06)
Coherence[b]**/**	2.4 (.47)	2.25 (.5)	2.31 (.44)	3.82 (.53)	2.52 (.45)	3.89 (.31)	3.69 (.78)	3.86 (.42)
Structure[b]**/**	1.94 (.76)	1.76 (.53)	1.71 (.66)	3.73 (.71)	1.94 (.61)	3.84 (.36)	3.50 (.83)	3.82 (.48)
Text-based measures								
Word count¯/*	83 (29)	77 (23)	84 (42)	93 (26)	94 (31)	106 (24)	122 (40)	146 (41)
Paragraph count**/**	1.4 (.6)	1.7 (1)	1.6 (.9)	3.6 (1.1)	1.7 (.5)	3.8 (.43)	3.2 (1.2)	3.2 (1.1)
Argumentational ties	.16 (.77)	.18 (.55)	.16 (.77)	.35 (.69)	.03 (.17)	.15 (.42)	.35 (.48)	.12 (.33)
Connective ties	6.7 (3.2)	7.4 (3.7)	6.1 (3.1)	8.6 (2.3)	9.0 (4.1)	9.2 (2.5)	4.0 (1.4)	5.8 (1.8)
Lexical ties	9.8 (5.6)	10.5 (5.3)	13.0 (6.6)	12.3 (5.1)	16.4 (5.1)	14.0 (5.1)	6.4 (4.5)	7.4 (3.3)
Anaphoric ties**/*	1.5 (1.2)	1.6 (2.6)	1.4 (1.7)	3.9 (2.5)	2.4 (2.1)	4.0 (2.5)	3.7 (1.8)	2.2 (1.9)
Reformulation ties**/*	0	.09 (.62)	.10 (.34)	1.0 (.60)	.30 (.97)	1.3 (.51)	.58 (.53)	.68 (.3)
Structural ties**/*	.90 (2.0)	.37 (1.7)	.40 (2.0)	1.5 (1.2)	.32 (.52)	1.5 (.89)	.59 (.73)	1.1 (.85)
Metastructural ties**/**	.05 (.27)	0	0	1.1 (.55)	.20 (.58)	.94 (.33)	.74 (.43)	.82 (.28)

Notes: Standard deviations are shown in parentheses. *$p < .05$, **$p < .005$. Statistical significance is indicated first for baseline/post-test by group interaction, and then for baseline/delayed post-test by group interaction for just those participants completing the compare–contrast essay at delayed post-test.

[a] Minimum = 1, maximum = 6.

[b] Minimum = 1, maximum = 4. Cohesion measures are for tie-density calculated as 100 × (number of ties/number of words in text).

3.13. Reader-based evaluations

Text quality, as indicated by reader-based measures of coherence, structure, and overall quality, improved substantially as a result of CSRI (for group × trials (baseline vs. post-test) interaction: $F(1,93) = 146.9$, $p < .001$, $\eta^2 = .61$ for coherence, $F(1,93) = 158.7$, $p < .001$, $\eta^2 = .63$ for structure, and $F(1,93) = 214.4$, $p < .001$, $\eta^2 = .70$ for quality). These effects were sustained at delayed post-test (for group × trials (baseline vs. delayed post-test) interaction: $F(1,44) = 94.4$, $p < .001$, $\eta^2 = .68$ for coherence, $F(1,44) = 91.3$, $p < .001$, $\eta^2 = .67$ for structure, and $F(1,44) = 94.8$, $p < .001$, $\eta^2 = .68$ for quality). The same pattern of results was found for students completing cause–effect and opinion essay tasks at delayed post-test with positive effects of CSRI significant at $p < .001$ for all three reader-based measures and for both tasks. There was no evidence of systematic differences among the three tasks.

3.14. Text-based evaluation

Mean coherence-tie densities are reported in Table 2. If writers engage with a topic in a more regulated way, considering their theme in more detail and attending to how content needs to be expressed to be comprehended by readers, it is reasonable to predict less reliance on repeated lexical items and connectives to maintain cohesion and increased use of more sophisticated linguistic devices. This is the pattern that we observed in CSRI participants. There was no statistically significant effect of CSRI, compared with the normal-curriculum group, on the density of either connective ties or lexical ties. There were, however, increases in the density of anaphoric, reformulation, structural, and metastructural ties (for group × trials [baseline vs. post-test] interaction effects on the density of, respectively, anaphoric ties, reformulation ties, structural ties, and metastructural ties: $F(1,93) = 12.2$, $p < .001$, $\eta^2 = .12$; $F(1,93) = 22.4$, $p < .001$, $\eta^2 = .19$; $F(1,93) = 9.1$, $p = .003$, $\eta^2 = .09$; and $F(1,93) = 97.3$, $p < .001$, $\eta^2 = .51$). Although argumentational-tie density followed the same trend, the effect was not statistically significant. Results at delayed post-test followed a similar pattern. For group × trials (baseline vs. delayed post-test) interaction effects on the density of, respectively, anaphoric ties, reformulation ties, structural ties, and metastructural ties we found $F(1,44) = 7.3$, $p = .01$, $\eta^2 = .14$; $F(1,44) = 4.3$, $p = .04$, $\eta^2 = .09$; $F(1,44) = 6.8$, $p = .012$, $\eta^2 = .13$; and $F(1,44) = 26.8$, $p < .001$, $\eta^2 = .38$. The effect of CSRI on metastructural ties was particularly marked at both post-test and delayed post-test. Assessment of the effect of CSRI on the groups that wrote opinion and cause–effect essays at delayed post-test was problematic because these genres may promote the use of different kinds of cohesion devices from those used for the baseline (compare–contrast) task. However, for these groups there was no evidence of an overall decrease in coherence, compared with the ordinary curriculum, and both showed statistically significant increases in the use of structural and metastructural ties.

We also looked at specific macro-structural features – whether or not the texts included introductory and concluding paragraphs – that support a text's global coherence and might, therefore, be associated with a more regulated approach to planning. Texts produced at baseline did not, except in one instance, include introductory paragraphs. At post-test only 2 (8%) of the ordinary-curriculum group, but 67 (94%) of CSRI participants included introductions in their text. Similarly, only one student generated a concluding paragraph at baseline. At post-test only one student in the ordinary-curriculum group, but 61 (86%) of the CSRI students wrote concluding paragraphs. This pattern was repeated in the delayed post-test: Of the 22 CSRI participants that performed the compare–contrast task, 21 (95%) wrote introductions and 20 (91%) wrote concluding paragraphs, compared with two and one students, respectively, in the ordinary-curriculum condition. This effect generalised to the opinion and cause-and-effect tasks with, respectively, 21 (87%) and 25 (100%) of students writing introductory paragraphs, and 19 (79%) and 24 (96%) writing conclusions.

3.15. Relationships among dependent variables

3.15.1. Relationships among text measures

Table 4 shows relationships among the various reader-based and text-based measures, averaged across baseline, post-test, and delayed post-test conditions. Reader-based perceptions of coherence, structure and overall quality were related to the extent to which texts made use of reformulation and metastructural ties, although the apparent relationship with reformulation-tie density may be an artefact of the correlation between this variable and the number of paragraphs. There was also some relationship between reader-based measures and connective-tie density. Reader

Table 4
Mean bivariate correlations among text measures, averaged across baseline, post-test, and delayed post-test

	2	3	4	5	6	7	8	9	10	11	12
Reader-based measures											
1. Coherence	.80**	.83**	.43**	.52**	.03	.30**	.20	.17	.44**	.29**	.47**
2. Quality		.81**	.45**	.56**	.05	.28**	.20	.18	.46**	.27**	.39**
3. Structure			.36**	.60**	.02	.26*	.18	.12	.48**	.31**	.49**
Text-based measures											
4. Word count				.29**	−.01	.07	.15	.01	.15	.12	.01
5. Paragraph count					.00	.24*	.08	.08	.42**	.17	.31**
6. Argumentational ties						.07	.06	.01	.03	−.02	.00
7. Connective ties							.03	.13	.16	−.13	.11
8. Lexical ties								−.24	.04	.08	−.05
9. Anaphoric ties									.18	.04	.19
10. Reformulation ties										.16	.33**
11. Structural ties											.20
12. Metastructural ties											

Notes: *$p < .05$, **$p < .01$ Cohesion measures are for tie density calculated as 100 × (number of ties/total number of words in text). Values represent the mean correlation across baseline, post-test, and delayed-posts tasks for all participants.

perceptions appeared to be slightly positively influenced by the length of texts, and to a greater extent by the number of paragraphs.

Correlations among the three reader-based variables were high, suggesting poor discriminant validity in the context of this study. This appeared to be due to ceiling effects, and therefore low variability, in scores for the CSRI group at post-test and delayed post-test. Correlations among these variables just at baseline suffered less from ceiling effects and ranged between .64 and .69. These inter-measure correlations are broadly similar to those found by Spencer and Fitzgerald (1993). Reader-based coherence did not appear to be any more strongly related to text-based measures of coherence than were the other reader-based measures.

3.15.2. Process–product relationships

Although findings suggest that CSRI resulted in substantial increases in both cognitive self-regulation and text quality, it does not necessarily follow that the latter occurred as a result of the former. If a causal relationship was present then we would expect a positive correlation between the extent to which students engaged in cognitive self-regulation after CSRI, and the quality of their texts. All correlations reported in this section were statistically significant at $p < .05$ but should be treated with some caution given the skewed nature of data from the process measures.

There was some evidence of a relationship between time spent preplanning and the three reader-based text evaluations, although correlations were not strong (correlation of reported time outlining with reader-based measures at post-test for just students in the CSRI group: coherence $r = .29$; structure, $r = .32$; quality, $r = .25$). The correlation between time spent outlining and the number of words in the final text was weak ($r = .14$) and non-significant. This suggests, perhaps, that the relationship between preplanning and quality went beyond simply helping students to find more to write about. Outlining also appeared to predict number of paragraphs ($r = .26$) and lexical-tie density ($r = .27$), albeit weakly. Total writing time was positively correlated with each of the reader-based measures and, as might be expected, with word and paragraph count (coherence, $r = .31$; structure, $r = .34$; quality, $r = .30$; number of words, $r = .27$; number of paragraphs, $r = .39$). Reviewing and editing were not related to text measures, with the exception of a weak positive relationship between paragraph count and time spent editing ($r = .29$) although, as we noted, these activities were rare even post-CSRI. There were no other statistically significant correlations between product and process variables ($-.13 \leq r \leq .22$).

We further explored the relationship between process and quality measures using multiple regression, with a combined reader-based quality measure, calculated by summing across reader-based coherence, structure, and quality measures as the dependent variable and process measures as predictors and this combined quality measure seemed legitimate given the high correlations among the separate reader-based quality measures. These analyses looked just at participants in the CSRI group at post-test and delayed post-test. Pre-test and control group process measures showed insufficient variance to makes analyses for these data meaningful.

Table 5
Predicting text quality from process measures at post-test and delayed post-test

	Not controlling for baseline quality		Controlling for baseline quality	
	Post-test ($R^2 = .20$, $p = .02$)	Delayed post-test ($R^2 = .23$, $p = .009$)	Post-test ($R^2 = .28$, $p = .003$; $\Delta R^2 = .10$, n.s.)	Delayed post-test ($R^2 = .31$, $p = .001$; $\Delta R^2 = .13$, n.s.)
Baseline quality			.32**	.31**
Reading references	.01	−.25*	.01	−.22
Thinking about content	.06	−.07	.02	−.13
Writing outline	.43*	.34*	.34**	.20
Writing text	.27*	.37*	.18	.26*
Reading text	.08	.06	.02	.02
Changing text	.24	.12	.16	.10

Note: Data from CSRI group only. Values are standardised regression coefficients (β) from multiple regression analyses with combined quality measure as dependent variable and process measures as predictors. Baseline-controlled analyses involved a staged multiple regression with baseline quality measures entered first followed by process measures. ΔR^2 indicates increase in the proportion of variance accounted for as a result of introducing process measures. Data from all 71 CSRI participants were used for both post-test and delayed post-test analyses. *$p < .05$, **$p < .01$.

Findings from these analyses are shown in Table 5. Analyses of data collected at post-test, and disregarding baseline scores, suggested that 20% of variance could be explained by variation in process. This resulted largely from a positive relationship between quality, and time spent outlining and time spent transcribing full text. There was also a positive relationship between time spent changing text and quality, although this fell just short of statistical significance ($p = .06$). At delayed post-test we found a similar pattern, and also a negative relationship between quality and time spent reading reference materials and a much weaker relationship between quality and changing text. The delayed post-test analysis was based on the full CSRI sample, and so represents writers composing in three different genres.

This finding of a relationship between process and product may indicate that certain writing processes result in better text. Alternatively, however, they may simply be due to the fact that better students, when exposed to the intervention, are more likely to comply with the instruction to plan. More direct evidence that the effect of CSRI resulted from students learning more effective writing processes would therefore be to find that writing quality was predicted by writing process even when controlling for baseline quality scores. We therefore conducted staged multiple regression analyses, with baseline quality scores entered first, followed by process variables. These are also reported in Table 5. Overall, adding process variables as predictors did not result in a statistically significant increase in the extent to which quality was explained by the model. This was true for both post-test and delayed post-test analyses. There was, however, evidence that time spent outlining was related to quality at post-test, although this relationship was weaker, and non-significant, at delayed post-test.

4. Discussion

These results suggest the following: (a) CSRI resulted in a substantial and sustained increase in the time students spent preplanning their text, (b) CSRI was not successful in increasing the time that students spent revising, (c) CSRI had a substantial positive effect on text quality, and (d) there was no strong evidence for a causal association between change in writing process and improvement in text quality.

The study adopted a quasi-experimental design without random allocation to normal-curriculum and CSRI groups. There is, therefore, some possibility that post-intervention differences between the two groups resulted from teacher, class, or school effects rather than the effects of the intervention. We do not, however, think that this provides a good explanation for our findings. Baseline scores, both for process and product measures, indicate that groups were broadly matched in terms of writing ability prior to the intervention. Instruction in both groups was by the students' normal literacy teacher, who had been taking the class for four months prior to the intervention. Statistically significant increases between baseline and post-test were in almost all cases associated with substantial changes in process and in text quality. We believe, therefore, that alternative explanations involving teacher effects or very different developmental trajectories for the two groups, though plausible, are unlikely to be correct.

It is also possible that the apparent increase in preplanning post-CSRI was due to bias in the students' reporting of their activities rather than a real change in their writing process: It is possible that CSRI taught them to label as outlining activities which were already present in their pre-CSRI writing processes. This explanation does not fit well with the rest of our findings, however. Total writing time – a measure that was not susceptible to this kind of reporting bias – increased dramatically as a result of CSRI, and reporting of other activities targeted by the intervention (reviewing and editing) did not increase. Given this, it would seem reasonable to assume that increased reporting of outlining indicated a genuine increase in the time that participants spent preplanning their text.

One final criticism of the present study is that writing tasks performed in the control condition varied in genre, whereas all tasks completed by the CSRI group during training were in the same compare–contrast genre as the pre- and post-test tasks. It may be that this alone explains quality improvements in the CSRI group. The fact that non-cause–effect texts produced by the CSRI group at delayed post-test were also of consistently higher quality than those of the control group suggests, perhaps, that this was not the case.

With these caveats in mind, we will discuss each of our main findings in turn.

Findings regarding preplanning have four related implications. First, the absence of outlining at baseline and in the ordinary-curriculum group suggests that incorporation of preplanning into the writing process does not develop either spontaneously or as a result of instruction that is wholly text-focused. Second, the increase in time spent outlining following CSRI suggests that normally functioning sixth-grade students are cognitively sufficiently well developed to be able to preplan their text, even in the absence of immediate teacher prompts. The exact nature of these preplanning processes, and how they compare to the preplanning strategies adopted by experienced writers, is not clear and should be the focus of future research. However, whatever the underlying cognitive mechanisms, our findings suggest that sixth-grade minds are capable of supporting some form of preplanning in the context of text production. Third, the findings of previous research that suggest that cognitive self-regulation in writing can be taught effectively by modelling and emulation (Braaksma et al., 2004; Graham et al., 1995; Sawyer et al., 1992; Zimmerman & Kitsantas, 2002) appear to generalise to a younger and normally functioning population. Fourth, this form of intervention is capable of delivering a sustained change in students' writing behaviour.

CSRI did not result in increases in the time students spent reviewing and editing their text despite more intervention time being devoted to these activities than to preplanning. This is consistent with research that suggests that revision tends to emerge later than preplanning in developing writers (Berninger & Swanson, 1994). There are, perhaps, both cognitive-developmental and motivational reasons why revision is resistant to CSRI in this age group. Revision that affects deep structure involves both developing a representation of the meaning of the text as it might be constructed by another reader and holding this representation independently of, but simultaneously with, a representation of intended meaning. The teacher modelling of revision, and teacher and peer commentary on student's own texts which formed the core of the CSRI might reasonably be expected to develop students' ability to construct representations of the meaning of the text from a reader's perspective. It may be that the cognitive resources required for maintaining both representations and/or the cognitive mechanisms required to juggle between them are not yet available to sixth-grade writers. De La Paz, Swanson, and Graham (1998) found that even at eighth grade children were able to revise substantively only when the executive control processes necessary for managing the revision process were externally supported.

Motivationally, there may be a negative trade-off between extensive preplanning, which took up a mean of 25% of writing time post-CSRI, and revision. If a student has spent considerable time planning what to say, they may be reluctant to undo that work by then making meaning-altering changes to their text. This reluctance may make practical sense. In common with most writing tasks that students at this level are likely to undertake, successful completion required a relatively short piece of writing. With extensive preplanning, and within the limits of their topic and discourse knowledge, it is possible that students were able to produce nearly optimal text at their first attempt. As we noted above, substantive revision even in much older writers does not necessarily result in improved text (Perl, 1979). There may also be a more fundamental incompatibility between plan-centred and revision-centred approaches to writing (Galbraith & Torrance, 2004) with extensive preplanning, for some writers and some writing tasks, inhibiting the effectiveness of subsequent rewriting.

Finally, it may simply be that the particular instructional model adopted in this study was not well suited to teaching revision. Existing research exploring the use of revision strategies in child writers suggests that for interventions to be successful they may need to be specifically targeted at reducing cognitive load (Chanquoy, 2001; De La Paz, Swanson, & Graham, 1998; Graham and Harris, 1997a,b). It may be that the combination of modelling and emulation used in

this study, though effective in developing preplanning strategies, did not offer sufficient explicit procedural support to offset the greater cognitive demands of reviewing and editing.

Consistent with a number of previous studies (Graham, 2006), the findings of the present study suggest that instruction aimed at developing effective, self-regulated writing strategies result in improvement in students texts. The three reader-based measures of text quality all showed dramatic increases post-CSRI. The various cohesion-tie measures paint a more detailed picture of the nature of the improvements to the students' texts. Prior to CSRI metastructural, structural, and reformulation ties were largely absent. After CSRI these appeared in most students' texts. Metastructural and structural ties serve to provide the reader with a discursive framework in which to mentally organise forthcoming text. Recursive ties summarize or reiterate already-expressed content. In all three cases, inclusion of these ties indicates that rather than just writing down what comes to mind, students were paying attention to their readers' ability to interpret what they had written. This suggests, therefore, that CSRI might promote a movement away from a simple knowledge-telling approach to writing.

The longer term effects of strategy interventions on text quality have not typically been studied in previous large-group intervention studies (Graham, 2006), and it has also been relatively rare for studies to explore generalisation to other genres. Harris, Graham, and Mason (2006) and Graham, Harris, and Mason (2005) found that in, respectively, poor second-grade writers and poor third-grade writers, the benefits of strategy intervention remained 8–12 weeks after the end of training and generalised well to non-taught genres. Our study replicated these findings in older and more able writers.

CSRI therefore resulted in substantial increases both in the time that students spent preplanning and in the quality of their texts. If these effects were causally related – if improvements in text quality resulted from students having learned to preplan – then one might expect a large proportion of the variance in post-CSRI text quality to be explained by the time students spent planning. We found, however, that text quality was only weakly predicted by time spent preplanning, and that this effect disappeared at post-test (although not at delayed post-test) when we controlled for prior ability.

One possible reason for finding only a weak relationship is that the writing log method provides a quite poor estimate of the actual time spent in different writing activities. For the relatively short writing periods involved in the present study time-in-activity measures from writing logs are likely to include a large error component, although this error should be randomly distributed. In the absence of alternative methods for collecting process information from large samples of group-tested primary-age children, writing logs have some value. However, correlations involving writing log measures may underestimate the strength of relationships among underlying constructs. It might also be that time spent planning is not a good measure of the extent to which students engaged in the kinds rhetorical goal-setting and problem-solving activity that are associated with knowledge transforming and at which the intervention was targeted. Quantity does not necessarily equate with quality: Students could plan for long periods, but still fail to knowledge-transform. Future research might usefully evaluate interventions of this kind with detailed examination of students' planning strategies using, for example, think-aloud or directed retrospection methods. Even if students engage in effective forms of planning it is probably not the case that the more preplanning engaged in the better. At some point returns will start to diminish and this will be reached sooner when, as in the present study, the task requires a relatively short text. The fact that preplanning decreased as a proportion of total writing time in the delayed post-test compared to the post-test might suggests perhaps that students had become more practiced at preplanning, or had integrated it more successfully with the rest of their writing processes.

Alternatively, however, it may be that the effects of CSRI on cognitive strategies and on text quality are, in fact, largely independent. In common with a number of previous package interventions (e.g., Englert, 1992; Graham and Harris, 1993) training in our study involved teaching both preplanning and text structure. It may be that the latter was more responsible than the former for improvements in text quality. It is difficult to separate the procedural knowledge associated with developing cognitive strategies such as preplanning, and declarative knowledge of text structure, and it would be problematic to teach effective preplanning strategies without also making reference to what is to be planned, particularly when the pedagogic approach involves modelling and emulation. Although some previous research has independently manipulated preplanning (Kellogg, 1988, 1990), training studies that are designed to affect persistent changes in writing strategy, particularly in younger writers, will necessarily mix procedural and discourse-knowledge instruction.

In summary, the findings of this study have implications both for an understanding of writer development, and for classroom practice. Our findings suggest that 11- and 12-year-old children are cognitively sufficiently well developed

to incorporate preplanning into their writing processes. Evidence from the delayed post-test suggests that CSRI participants had internalized preplanning as a form of self-regulation, at least in the context of expository writing tasks, a competence that goes beyond simply responding to immediate prompts from the teacher. From a practical perspective, the present study confirms the earlier findings that interventions that aim to impart both discourse knowledge and cognitive skills, that are relatively sustained, and that use a combination of teacher modelling and scaffolded student emulation can result in substantial benefits for the quality of texts written by normally functioning students. Our study suggests (a) that this effect extends to sixth-grade children and to the Spanish educational context where, perhaps because of the absence of any previous process training, effects appear larger, (b) that training of this sort has particular impact on whether and how students make their texts cohere, perhaps indicating a move towards more reader-based approach to writing, and (c) that this kind of training not only results in improved quality but also impacts process. We did not, however, find evidence of a strong process–product association, or that training of this from is capable of developing mature revision practices. These issues might usefully be the focus of future research.

Acknowledgements

This research was made possible by funds from DGI-MCyT (BSO 2003-03106), for 2004–2006 awarded to the third author. The authors would like to thank the following schools for their assistance: Colegio Nuestra Madre del Buen Consejo, Padres Agustinos de León; Colegio Sagrado Corazón Jesuitas de León. We are also grateful to David Galbraith, Steve Graham, and an anonymous reviewer for helpful comments on an earlier draft of this paper. Correspondence should be directed to Mark Torrance, Centre for Educational Psychology Research, Psychology Department, Staffordshire University, College Road, Stoke-on-Trent, ST4 2DE, UK, m.torrance@staffs.ac.uk; or to Raquel Fidalgo/Jesús-Nicasio García, Universidad de León, Psicología Evolutiva y de la Educación, Departamento de Filosofía y Ciencias de la Educación, Campus de Vegazana, s/n; 24071-León, Spain, dfcrfr@unileon.es/dfcjgs@unileon.es.

References

Bereiter, C., Burtis, P. J., & Scardamalia, M. (1988). Cognitive operations in constructing main points in written composition. *Journal of Memory and Language, 27*, 261–278.

Bereiter, C., & Scardamalia, M. (1982). From conversation to composition: The role of instruction in a developmental process. In R. Glaser (Ed.), *Advances in instructional psychology, Vol. 2* (pp. 1–64). Hillsdale, NJ: Erlbaum.

Berninger, V., & Swanson, H. L. (1994). Modifying Hayes and Flower's model of skilled writing to explain beginning and developing writing. In E. C. Butterfield (Ed.), *Children's writing: Toward a process theory of the development of skilled writing* (pp. 57–81). Greenwich, CT: JAI Press.

Berninger, V., Yates, C., Cartwright, A., Rutberg, J., Remy, E., & Abbott, R. (1992). Lower level developmental skills in beginning writing. *Reading and Writing, 4*, 257–280.

Berninger, V. W., Fuller, F., & Whitaker, D. (1996). A process model of writing development across the life span. *Educational Psychology Review, 8*(3), 193–218.

Bosque, I., & Demonte, V. (1999). *Gramática descriptive de la lengua española*. In: *Entre la oración y el discurso, Vol. 3*. Madrid: Espasa Calpe, S.A.

Bourdin, B., & Fayol, M. (2002). Even in adults, written production is still more costly than oral production. *International Journal of Psychology, 37*(4), 219–227.

Braaksma, M. A. H., Rijlaarsdam, G., & van den Bergh, H. (2002). Observational learning and the effects of model-observer similarity. *Journal of Educational Psychology, 94*(2), 405–415.

Braaksma, M. A. H., Rijlaarsdam, G., van den Bergh, H., & van Hout-Wolters, B. H. A. (2004). Observational learning and its effects on the orchestration of writing processes. *Cognition and Instruction, 22*(1), 1–36.

Burtis, B., Bereiter, C., Scardamalia, M., & Tetrse, J. (1983). The development of planning in writing. In G. Wells, & B. Kroll (Eds.), *Explorations in the development of writing* (pp. 153–174). New York: Willey.

Chanquoy, L. (2001). How to make it easier for children to revise their writing: a study of text revision from 3rd to 5th grades. *British Journal of Educational Psychology, 71*, 15–41.

Danoff, B., Harris, K. R., & Graham, S. (1993). Incorporating strategy instruction within the writing process in the regular classroom. Effects on the writing of students with and without learning disabilities. *Journal of Reading Behavior, 25*, 295–319.

De La Paz, S. (1999). Self regulated strategy instruction in regular educational settings: improving outcomes for students with and without learning disabilities. *Learning Disability Research and Practice, 14*(2), 92–106.

De La Paz, S., & Graham, S. (2002). Explicitly teaching strategies, skills, and knowledge: writing instruction in middle school classrooms. *Journal of Educational Psychology, 94*(4), 687–698.

De La Paz, S., Swanson, P. N., & Graham, S. (1998). The contribution of executive control to the revising by students with writing and learning difficulties. *Journal of Educational Psychology, 90*(3), 448–460.

Englert, C. (1992). Writing instruction from a sociocultural perspective: holistic, dialogic, and social enterprise in writing. *Journal of Learning Disabilities, 25*, 153–172.

Englert, C., Raphael, T., Anderson, L., Anthony, H., & Stevens, D. (1991). Making writing strategies and self talk visible: cognitive strategy instruction in writing in regular and special education classrooms. *American Educational Research Journal, 28*, 337–372.

Fitzgerald, J. (1987). Research on the revision process. *Review of Research in Education, 57*(4), 481–506.

Flower, L. (1979). Writer-based prose: a cognitive basis for problems in writing. *College English, 41*(1), 19–41.

Flower, L., & Hayes, J. (1977). Problem solving strategies and the writing process. *College English, 39*, 449–461.

Galbraith, D., & Torrance, M. (2004). Revision in the context of different drafting strategies. In L. Allal, L. Chanquoy, & P. Largy (Eds.), *Revision of written language: Cognitive and instructional processes* (pp. 63–86). Dordrecht, Netherlands: Kluwer.

García, J. N., & Arias-Gundin, O. (2004). Intervention in writing composition strategies. *Psicothema, 16*(2), 194–202.

Grabowski, J. (1996). Writing and speaking: Common grounds and differences, toward a regulation theory of written language production. In M. Levy, & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications*. Mahwah, NJ: Erlbaum.

Graham, S. (2006). Strategy instruction and teaching of writing: A meta-analysis. In C. MacArthur, S. Graham, & J. Fitzgerlad (Eds.), *Handbook of writing research* (pp. 187–207). New York: Guilford Publications.

Graham, S., & Harris, K. R. (1993). Self-regulated strategy-development – helping students with learning-problems develop as writers. *Elementary School Journal, 94*(2), 169–181.

Graham, S., & Harris, K. R. (1997a). It can be taught, but it does not develop naturally: myths and realities in writing instruction. *School Psychology Review, 26*(3), 414–424.

Graham, S., & Harris, K. R. (1997b). Self-regulation and writing: where do we go from here? *Contemporary Educational Psychology, 22*(1), 102–114.

Graham, S., & Harris, K. R. (2000). The role of self-regulation and transcription skills in writing and writing development. *Educational Psychologist, 35*(1), 3–12.

Graham, S., Harris, K. R., & Mason, L. (2005). Improving the writing performance, knowledge and motivation of young struggling writers. The effects of self-regulated strategy development. *Contemporary Educational Psychology, 30*, 207–241.

Graham, S., Harris, K. R., & Troia, G. A. (2000). Self-regulated strategy development revisited: teaching writing strategies to struggling writers. *Topics in Language Disorders, 20*(4), 1–14.

Graham, S., Macarthur, C., & Schwartz, S. (1995). Effects of goal-setting and procedural facilitation on the revising behavior and writing performance of students with writing and learning-problems. *Journal of Educational Psychology, 87*(2), 230–240.

Green, D. W., & Wason, P. C. (1982). Notes on the psychology of writing. *Human Relations, 35*, 47–56.

Halliday, M., & Hassan, R. (1976). *Cohesion in English*. London: Longman.

Harris, K. R., & Graham, S. (1992). Self-regulated strategy development: A part of the writing process. In M. Pressley, K. R. Harris, & J. Gutherie (Eds.), *Promoting academic competence and literacy in school* (pp. 277–309). San Diego, CA: Academic Press.

Harris, K. R., & Graham, S. (1996). *Making the writing process work: Strategies for composing and self regulation*. Cambridge, MA: Brookline.

Harris, K. R., Graham, S., & Mason, L. (2006). Improving the writing performance, knowledge and motivation of young struggling writers in second grade. *American Educational Research Journal, 43*, 295–340.

Hayes, J. R., & Flower, L. S. (1980a). Identifying the organisation of writing processes. In L. Gregg, & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 3–30). Hillsdale, NJ: Erlbaum.

Hayes, J. R., & Flower, L. S. (1980b). Writing as problem solving. *Visible Language, 14*(4), 288–299.

Hillocks, G. (November 1984). What works in teaching composition: a meta-analysis of experimental treatment studies. *American Journal of Education,* 133–170.

Kellogg, R. (1988). Attentional overload and writing performance: effects of rough draft and outline strategies. *Journal of Experimental Psychology: Learning, Memory and Cognition, 14*(2), 355–365.

Kellogg, R. T. (1990). Effectiveness of prewriting strategies as a function of task demands. *American Journal of Psychology, 103*(3), 327–342.

McCutchen, D. (1988). Functional automaticity in children's writing – a problem of metacognitive control. *Written Communication, 5*(3), 306–324.

McCutchen, D. (1996). A capacity theory of writing: working memory in composition. *Educational Psychology Review, 8*(3), 299–325.

Perl, S. (1979). The composing processes of unskilled college writers. *Research in the Teaching of English, 13*(4), 317–336.

Piolat, A., & Olive, T. (2000). How can the process and cost of writing texts be studied? The triple task methodology. *Annee Psychologique, 100*(3), 465–502.

Plimpton, G. (1965). *Writers at work: The Paris Review interviews*. New York: Viking.

Sanders, T. J. M., Spooren, W. P. M., & Noordman, L. G. M. (1992). Toward a taxonomy of coherence relations. *Discourse Processes, 15*(1), 1–35.

Sawyer, R. J., Graham, S., & Harris, K. R. (1992). Direct teaching, strategy instruction, and strategy instruction with explicit self-regulation – effects on the composition skills and self-efficacy of students with learning-disabilities. *Journal of Educational Psychology, 84*(3), 340–352.

Scardamalia, M., & Bereiter, C. (1985). Research on written composition. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 778–803). New York: Collier Macmillan.

Scardamalia, M., & Bereiter, C. (1991). Literate expertise. In K. A. Ericsson, & J. Smith (Eds.), *Toward a general theory of expertise: Prospects and limits* (pp. 172–194). Cambridge: Cambridge University Press.

Scardamalia, M., Bereiter, C., & Steinbach, R. (1984). Teachability of reflective processes in written composition. *Cognitive Science, 8*, 173–190.

Schunk, D., & Zimmerman, B. (1997). Social origins of self-regulatory experience. *Educational Psychologist, 32*, 195–208.

Sexton, M., Harris, K. R., & Graham, S. (1998). Self-regulated strategy development and the writing process: effects on essay writing and attributions. *Exceptional Children, 64*(3), 295–311.

Sorenson, S. (1997). *Student writing handbook: The only complete guide to writing across the curriculum*, (3rd ed.). New York: MacMillan.

Spencer, S. L., & Fitzgerald, J. (1993). Validity and structure, coherence, and quality measures in writing. *Journal of Reading Behavior, 25*(2), 209–231.

Torrance, M., Thomas, G. V., & Robinson, E. J. (1999). Individual differences in the writing behaviour of undergraduate students. *British Journal of Educational Psychology, 69*, 189–199.

Wallace, D. L., Hayes, J. R., Hatch, J. A., Miller, W., Moser, G., & Silk, C. M. (1996). Better revision in eight minutes? Prompting first-year college writers to revise globally. *Journal of Educational Psychology, 88*(4), 682–688.

Zimmerman, B. J., & Kitsantas, A. (2002). Acquiring writing revision and self-regulatory skill through observation and emulation. *Journal of Educational Psychology, 94*(4), 660–668.

Zimmerman, B. J., & Risemberg, R. (1997). Becoming a self-regulated writer: a social cognitive perspective. *Contemporary Educational Psychology, 22*(1), 73–101.