

EDUCATIONAL IMPLICATIONS OF THE THEORETICAL MODELS OF TEXT REVISION

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At present, writing is considered a complex activity which consists of three major processes: planning, editing and revising. Revision is considered to be one of the central, important components of written composition, affecting the writer's knowledge and the quality of the texts produced just as the different general writing models and psychological approaches indicate by consensus. The aim of this paper is to review the advantages, limitations, applications and implications of the CDO procedure in text revision given its importance and complexity on being considered a recursive process throughout the writing process; as well as the fact that students do not revise spontaneously which affects their performance and success at school among other environments in the same way as do other personal factors and variables such as motivation and self-regulation.

Keywords: writing, revision process, CDO procedure, educational implications.

Actualmente, se considera la escritura como una actividad compleja que implica tres grandes procesos: planificar, editar y revisar; así, se considera la revisión como uno de los componentes centrales e importantes de la composición escrita, afectando al conocimiento del escritor e incidiendo en la calidad de los textos producidos, tal y como de forma consensuada indican los diferentes modelos generales de la escritura y enfoques psicológicos. El objetivo de este trabajo, es revisar las bondades, limitaciones, aplicaciones e implicaciones del procedimiento CDO de revisión textual, dada su importancia y complejidad, al ser considerado como un proceso recursivo a lo largo de todo el proceso de escritura; así como el hecho de que los estudiantes no revisan de forma espontánea, afectando esto a su rendimiento y éxito escolar, entre otros ámbitos, del mismo modo que inciden otros factores y variables personales como la motivación y la autorregulación.

Palabras clave: escritura, proceso de revisión, procedimiento CDO, implicaciones educativas.

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The aim of the following work is to present and analyse the CDO procedure in relation to the different cognitive models of text revision in order to determine its limitations, advantages, implications and applications for educational intervention and instruction in the classroom context, as well as to counsel teachers and all professionals involved in the intervention, given the attention paid to this process of written composition by the different general models of writing and psychological approaches (see revision by Arias-Gundín and García, in press).

The study of writing has been evolving up to the present where its interest is centred on the study of the processes involved (see proposals by Alamargot and Chanquoy, 2001; MacArthur, Graham and Fitzgerald, 2006). The emphasis at the beginning of this new period was placed on the cognitive operations involved in writing as an

individual problem-resolution task, progressively shifting the focus of study to how the immediate context, pedagogic devices which promote or hinder textual production and culture through its usual practices, representations and genres, affect textual elaboration (Flower & Higgins, 1991; Lea, 1999; Piolat & Roussey, 1992).

Taking a close look at the different theoretical models on writing (see revision by Arias-Gundín and García, in press), in general two types of cognitive processes can be distinguished: low-level or mechanical processes and high-level or substantive processes, including the writing revision process in the framework of the latter. Hence, in the model proposed by Hayes and Flower (1980), the process of revision is explicitly included considering it both an autonomous and recursive activity, and therefore composed of text reading as well as its correction which interrupts the remaining processes that compose writing. On the contrary we cannot find text revision explicitly included in any of the models by Bereiter and Scardamalia (1987), although it can implicitly be found in the *knowledge telling* model where the writer determines the discrepancy between the intended and produced texts through the process of text interpretation, reading and

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text comprehension. Likewise, it is considered that the writing monitorization component of the model proposed by Kellogg (1996) refers to revision, including the reading and/or rereading of a written text and its editing, taking place within some working memory component.

As has been highlighted, revision is considered by the different models as one of the central and most important components in the general process of written composition given that a text is rarely well-written at the first attempt, it affects the writer's knowledge and it undoubtedly affects the quality of written texts (Beal, 1996; Perez, 2001). Fitzgerald (1987) considered revision to be the changes made in the writing process; thus, during the revision phase the hardest aspect of writing takes place, being really important that the produced texts are well-revised as the changes that are made during the revision of a text are what makes a text acquire quality; therefore, revision is understood as the moment where the writer makes the modifications that he/she considers necessary to improve and complete the produced text with respect to the text he/she had in mind (Cameron, Edmundo, Wigmore, Hunt & Linton, 1997; Guilford, 2001; Perez, 2001).

In general, there are few students who revise their own texts without the support of their teachers, making small superficial revisions which show the scarce use of self-regulation or evaluation processes, and performing the revision without metacognitive control, as well as minimizing the role conferred to revision and self-regulation skills (Klassen, 2002). These students mainly value the more superficial or mechanical aspects of writing as opposed to the more profound or substantive aspects, almost exclusively considering that good writing is that which is free of mechanical errors, whereas expert writers focus their attention on the substantive aspects (Butler, Elashuk & Poole, 2000).

Given the importance and difficulty it entails for students to efficiently perform the text revision process, it is necessary to generate resources in order to carry out intervention programs both in the classroom with the whole group and in an individual manner taking care of the needs and characteristics of each student by providing the specific intervention required in any of the contexts of action. In order to carry out precise educational interventions and counseling for all the professionals involved, it is necessary to perform an analysis of the specific models of the revision process which have had a significant influence on the study and development of text revision to determine both their implications and

applications and be able to elaborate/propose a truly useful model to work within the educational field. In this sense, and with all specific theoretical text revision models revised (Arias-Gundín, 2005), we then present and propose the CDO text revision model elaborated by Scardamalia and Bereiter (1985). It cannot really be considered a theoretical model of text revision but it is the most complex and complete description of the revision activity and from an educational point of view, it is a technique which really helps all writers to revise, an implication which will be addressed later. However, this structure of text revision has been used psychologically in order to understand the complexity of this process.

Model by Scardamalia and Bereiter (1985)

Scardamalia and Bereiter proposed a technical process or procedure of revision, which is easy to teach to writers and more specifically to writers who do not make spontaneous revisions (see Figure 1). The way the revision process works is through a self-regulation procedure composed of three mental recursive operations which can be linked together interacting throughout the whole revision phase. The cognitive operations involved in revision are comparison, diagnosis and action, giving way to the *CDO procedure* (compare, diagnose, operate). These three operations deliberately intervene in a cyclical manner during the whole revision process allowing the writer to revise the text sentence by sentence.

According to their writing model (Bereiter & Scardamalia, 1987), two mental representations of the text are constructed and stored in the long-term memory, one of the elaborated text and another of the desired text. It is very important to underscore this difference because the final form of the text is, in many cases, completely different from the text the writer had in mind and the mental representation he/she had of it. This fact permits us to explain why writers find it easier to revise other people's works. When they revise their own texts, they do not read what is written; instead, they read what they think they had written. The findings by Chanquoy (2001) supported this explanation and permitted her to state that delayed revision is more efficient than self-regulated revision at the moment of writing the text.

This way, the *CDO process* is activated when an imbalance between both texts (the intended or thought-out and the executed) is detected. That is, in terms of control in the writing process, the CDO process generally interrupts other processes involved in writing. The three



basic operations in the *CDO process* are carried out in the following order: first, the act of *comparing* assesses the discrepancies between both texts to identify the fragment in which an imbalance is perceived; when said imbalance is detected, the act of *diagnosing* determines the nature of the problem as well as the possible corrections; finally, the *action* executes the desired corrections with the support of two other components: the selection of the necessary strategy to solve the problems and the generation of the changes in the text.

Similarly, in the models proposed by Hayes (Hayes, 1996; Hayes, Flower, Schriver, Stratman & Carey, 1987), text revision is conceptualized as a recursive activity throughout the writing process, being necessary to work the revision of the text not only in the text already edited but from the moment the writing activity is planned; that is, from the definition of the task, its planning, the detection of the discrepancies between the intended text and the produced text, to the resolution of the perceived imbalance just as it is reflected in the knowledge that Hayes et al. (1987) identified as necessary for revision.

The modification of text fragments is considered problematic; that is, making changes when the writer considers that they are necessary. This is characteristic when the writer does not know how to make the necessary

changes. Furthermore, according to the proposals by Scardamalia and Bereiter, writers need to know a certain number of subprocesses: assessment, tactic decisions (i.e. eliminate, rewrite) and executive control of text revision, just as it is included in other theoretical models. In addition, we must remember that Hayes (1996) considers that to understand revision, it is not enough to identify the processes involved in it but instead we must interiorize them and understand why they take place. Then, the comprehension by the writer of the strategies involved will allow him/her to know when, where, how and why to use, assess and control the cognitive strategies (Butterfield, Hacker & Albertson, 1996); that is, assessment and control are considered to be automatic processes stored in the long-term memory.

It is important to emphasize that this procedure can stop at any moment of its recursivity and fail to successfully end the revision. This permits us to compare and interpret the existing theoretical models and affirm that simply rereading the revised text does not convey the detection and correction of errors, whatever their nature. This way, according to Alamargot and Chanquoy (2001), it is necessary to foresee some of the behaviours that writers exhibit during the revising activity.

Likewise, the model by Hayes (1996) includes the

FIGURE 1
MODEL OF THE CDO PROCESS, ADAPTED FROM SCARDAMALIA AND BEREITER (1983)

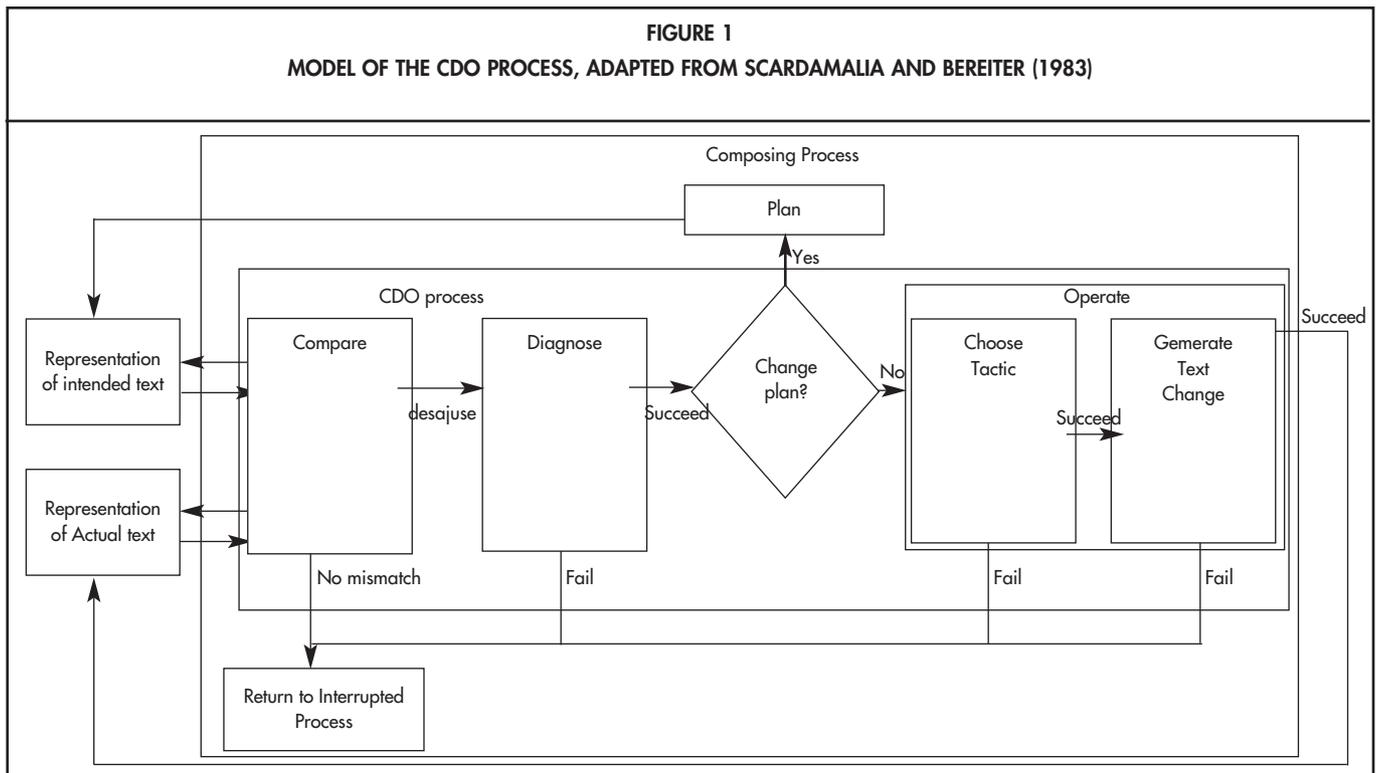


TABLE 1
SYNTHESIS OF INSTRUCTIONAL PROGRAM IN THE CDO PROCEDURE OF TEXT REVISION

Topic	Session	Strategies and Techniques	Materials used	
			Exercises	Work guides
Topic I: Sensibilization and importance of writing	1. Sensibilizing students regarding the importance of writing	<ul style="list-style-type: none"> * Discussion * Brain storming * Enumeration * Prioritization 	<ul style="list-style-type: none"> <input type="checkbox"/> Why am I writing? <input type="checkbox"/> My pyramid 	
	2. Promoting reflection and implication of students in writing	<ul style="list-style-type: none"> * Discussion * Brain storming 	<ul style="list-style-type: none"> <input type="checkbox"/> Writing skills questionnaire <input type="checkbox"/> I would like to write 	
Topic II: Approximation to the CDO process in the mechanical aspects of revision	3. Importance of revision	<ul style="list-style-type: none"> * Discussion * Guided practice * Comparison 	<ul style="list-style-type: none"> <input type="checkbox"/> Basketball I <input type="checkbox"/> Basketball II 	
	4. Revision of mechanical aspects I (error detection)	<ul style="list-style-type: none"> * Shaping * Reinforcement * Guided practice * Thinking outloud 	<ul style="list-style-type: none"> <input type="checkbox"/> Do I write well I? <input type="checkbox"/> The two donkeys 	⇒ Revision guide "revising the text I"
	5. Revision of mechanical aspects II (error detection)	<ul style="list-style-type: none"> * Identifying * Skill strengthening * Verbal modelling * Reinforcement * Focalization 	<ul style="list-style-type: none"> <input type="checkbox"/> The magpie thief 	⇒ Revision guide "revising the text I"
	6. Revision of mechanical aspects III (error detection and improvement proposals)	<ul style="list-style-type: none"> * Guided practice * Guided activity * Underlining * Reinforcement * Verbal shaping 	<ul style="list-style-type: none"> <input type="checkbox"/> The sweet-toothed octopus 	⇒ Revision guide "revising the text II"
	7. Revision of mechanical aspects IV (error detection and improvement proposals)	<ul style="list-style-type: none"> * Reinforcing * Underlining * Comparison * Verbal shaping 	<ul style="list-style-type: none"> <input type="checkbox"/> The squirrel family 	⇒ Revision guide "revising the text II"
	8. Revision of substantive aspects I (error detection)	<ul style="list-style-type: none"> * Shaping * Identifying * Guided practice * Thinking outloud * Underlining 	<ul style="list-style-type: none"> <input type="checkbox"/> Do I write well II? <input type="checkbox"/> The group of friends 	⇒ Revision guide "revising the text III"
	9. Revision of substantive aspects II (error detection)	<ul style="list-style-type: none"> * Strengthening * Modelling * Reinforcement * Guided practice * Underlining * Comparison 	<ul style="list-style-type: none"> <input type="checkbox"/> The disobedient little mice 	⇒ Revision guide "revising the text III"
Topic III: Approximation to the CDO process in the mechanical aspects of revision	10. Revision of substantive aspects III (error detection and improvement proposals)	<ul style="list-style-type: none"> * Enumeration * Guided activity * Underlining * Reinforcement * Modelling * Underlining * Comparing * Reinforcement 	<ul style="list-style-type: none"> <input type="checkbox"/> Minimus and Marramiau 	⇒ Revision guide "revising the text IV"
	11. Revision of substantive aspects IV (error detection and improvement proposals)	<ul style="list-style-type: none"> * Modelling * Underlining * Comparing * Reinforcement * Modelling 	<ul style="list-style-type: none"> <input type="checkbox"/> The trapeze-artist panther 	⇒ Revision guide "revising the text IV"
	12. Revision of mechanical aspects: spelling	<ul style="list-style-type: none"> * Skill strengthening * Modelling * Reinforcement * Attention focalizing * Comparison * Identification 	<ul style="list-style-type: none"> <input type="checkbox"/> Spelling <input type="checkbox"/> The turtle 	
Topic IV: Application of the CDO process in the revision of the mechanical aspects of the text	13. Revisión de aspectos mecánicos: Puntuación	<ul style="list-style-type: none"> * Attention focalizing * Reinforcement * Modelling * Skill strengthening 	<ul style="list-style-type: none"> <input type="checkbox"/> Punctuation <input type="checkbox"/> The scarecrow 	
	14. Revision of mechanical aspects: Grammar	<ul style="list-style-type: none"> * Shaping * Reinforcement * Skill strengthening 	<ul style="list-style-type: none"> <input type="checkbox"/> Grammar <input type="checkbox"/> A good menu 	
Topic V: Application of the CDO process in the revision of the substantive aspects of the text	15. Revision of substantive aspects: Change of words	<ul style="list-style-type: none"> * Skill strengthening * Attention focalizing * Identification * Shaping * Verbal reinforcement 	<ul style="list-style-type: none"> <input type="checkbox"/> Crossword puzzle <input type="checkbox"/> The writer mouse 	
	16. Revision of substantive aspects: Adding and/or omitting content	<ul style="list-style-type: none"> * Focalizing * Verbal reinforcement * Guided practice 	<ul style="list-style-type: none"> <input type="checkbox"/> The three mice <input type="checkbox"/> Rubén 	
	17. Revision of substantive aspects: Reordering	<ul style="list-style-type: none"> * Shaping * Reinforcing 	<ul style="list-style-type: none"> <input type="checkbox"/> Puzzle text <input type="checkbox"/> Lets sleep! 	
Topic IV: Practice of the CDO process in the global revision of texts	18. Revision of a text I	<ul style="list-style-type: none"> * Shaping * Verbal reinforcement * Guided practice 	<ul style="list-style-type: none"> <input type="checkbox"/> Teo's lapse 	
	19. Guided practice of text revision and restructuring.	<ul style="list-style-type: none"> * Shaping * Verbal reinforcement 	<ul style="list-style-type: none"> <input type="checkbox"/> The kids (Little goats) 	⇒ Revision guide
	20. Individual elaboration of a written composition	<ul style="list-style-type: none"> * Shaping * Verbal reinforcement 	<ul style="list-style-type: none"> <input type="checkbox"/> This summer 	⇒ Revision guide

necessary resources from both the working memory and the long-term memory for the first time, with the model by Butterfield, Hacker and Albertson (1996) being more complex. In addition to describing the behaviour of the reviser they also take into account contextual tasks, the writer's knowledge and strategies, and especially the role of both the working and the long-term memory. This way, this last model instead of solely describing the different revision subprocesses, specifies the knowledge and the necessary strategies included therein, and clarifies the essential role played by the working memory in the revision process in the same vein as in Kellogg's (1996) general writing model. In this way, the available cognitive resources in the working memory excessively limit the general writing process and can even overload it, especially in the case of inexperienced writers who still have not interiorized some of the writing processes (Swanson & Siegel, 2001). This overload essentially corresponds to low-level processes which harm the development of high-level processes given that the necessary cognitive resources are divided between the two processes.

Hence, text revision depends on the limited resources of the working memory, supported by the fact that all writers revise the superficial aspects more than the profound aspects of the text because mechanical or superficial revision is not only easier but it is also less demanding as these are the aspects we acquire and interiorize first.

The contributions made by Scardamalia and Bereiter (1985) are important although their process can be considered more a technique which facilitates revision than an explicative model. This type of procedure allows novice writers or those who present learning difficulties and/or low performance to revise their texts in a complete and systematic manner. Other significant contributions in the proposal made by these authors are to determine the definition of the subprocesses inherent in text revision which describes two assessment subprocesses (comparing and diagnosing), and the modification of the text which implies two actions (the selection of the correction approach and the generation of changes in the text). The teams of Flower, Hayes and Butterfield elaborated complex theoretical models regarding the text revision process which specified all the subprocesses and elements inherent in it.

Implications for intervention

Just as presented throughout this work, it is very important

that students perform efficient text revisions given that it is at this moment when a text acquires quality. To do so, it is necessary that students be instructed and trained in this complex task providing them with a wide range of strategies and procedures, without forgetting either the different elements and processes involved or the personal characteristics of each student (Perez, 2001), becoming especially important in this process the role played by the different professionals in the educational field.

At present, a great number of variables involved in the revision process are known making text revision a very complicated activity and essentially with a recursive character throughout the entire writing task. Thus, this process demands a large cognitive capacity so that the revision can be done in a precise and efficient manner. In this sense, it is important to remember the limited capacity of the working memory; hence it becomes necessary to interiorize some aspects of text revision so that those other aspects that require more attention can be carried out more skillfully. It is at this time when it becomes essential to design and elaborate specific intervention programs for each one of the elements and variables involved in revision, as well as to utilize efficient text revision procedures, design useful materials to facilitate revision in novice writers, writers with learning difficulties, with low performance..., and generate both material and instructional resources which will allow for each student the provision of only the help they need in the subprocess or action he/she has trouble with due to his/her lack of knowledge or to an incorrect execution (Arias-Gundín & García, 2008; Chanquoy, 2001).

The CDO procedure presented in this paper is a truly valid resource to facilitate the learning and execution of text revision throughout the writing process and the interiorization of some of its components such as the mechanical aspects of revision. To date, several studies have been done which prove the efficacy of this procedure with both low-performance students (Arias-Gundín & García, 2006) and with secondary students combined with levels of help (Arias-Gundín & García, 2007); at the same time, its efficacy increases when it is combined with adequate materials which allow writers to focus their attention solely and exclusively on those aspects they do not have interiorized permitting them to free up cognitive resources (Arias-Gundín & García, 2008; García & Arias-Gundín, 2008).

Next, and as an example, we present an instructional sequence based on the CDO procedure illustrated with



the standard procedure followed in one of them, accompanied by the materials necessary for its development.

This program can be implemented collectively with the whole classroom group or individually with the students who require it. In the first case, this task can be performed by the teacher in the area of "Spanish language" and be a part of classroom programming given that once the students know and are capable of applying this procedure autonomously the results will be observed not only in this area but also in the remaining curricular areas. We should not forget that writing is an extension of our memory, allowing the development of intelligence as it helps classify, specify and organize ideas. It is an instrument for teaching-learning, satisfies communicative necessities and permits the demonstration of knowledge in the school sphere. In the second case, the application of the procedure will be performed by some of the collaborating experts following the indications made by the school psychologist and/or psychopedagogue. This program consists of twenty sessions, each one around fifty minutes long, which are grouped into six sets of topics as shown in Table 1.

As a rule, all sessions follow the same pattern of development. They always begin with a reminder of the contents worked on in the previous session in order to link the reminder exercises with the activation of the previous, necessary knowledge that students have about the aspects that will be covered in the session. Next, the students' attention is focused on specific and novel contents using an interactive teaching style and, the teacher, by modeling, will do the first exercise which will serve as an example of the explained aspects; the next exercise will then be done by the all the students together with the teacher reinforcing satisfactory answers and shaping incorrect answers until reaching adequate ones. Immediately after, the students will do the exercises regarding these aspects individually and/or in pairs. To end the working session, the students individually and/or in pairs will do the reinforcement exercises, which will generally be related to the detection of errors, improvement proposals and/or rewriting of some text, whether in its complete form or a fragment.

Nevertheless and regardless of the program presented, in order to efficiently carry out the CDO revision procedure the following four steps must be implemented. The procedure starts with the careful reading of the text and its comprehension; next, students must detect and

diagnose the problems and /or errors there are in it. To do so, they can use the underlining strategy as it is one of the most efficient strategies for acquiring information (Roman & Gallego, 1994); subsequently, they must think, establish ways of solving the detected problems and propose improvements. Finally, students will rewrite the revised text.

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