The orchestration of processes in relation to the product, and the role of psychological variables in written composition

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Título: La orquestación de procesos en relación con el producto, y papel de las variables psicológicas en la composición escrita.
Resumen: Se investiga la distribución temporal de los procesos de escritura, mediante una técnica *on-line* de retrospección directa, y diferencias en el producto textual, desde los cursos más inferiores donde es posible atender a su estudio hasta últimos cursos de la enseñanza obligatoria. Además, se atiende al análisis de diversas variables psicológicas para analizar su incidencia moduladora en la escritura. Se utilizó una muestra muy depurada de 348 alumnos, con edades comprendidas entre los 9 y 16 años, con un desarrollo normalizado y unos niveles de competencia curricular y escritora dentro de la media. Los resultados indican patrones complejos de evolución del proceso de escritura y su orquestación, en comparación con el producto escrito, constatando que no existe una traducción directa entre la evolución del proceso de escritura y su distribución temporal, y la mejoría del producto escrito; todo ello mediado por variables psicológicas relacionadas con la presencia de creencias de auto-eficacia hacia el despliegue y uso de procesos escritores no calibradas de forma adecuada y la realización de atribuciones causales a factores externos, en los niveles educativos más inferiores. Se discuten las implicaciones, limitaciones y perspectivas futuras.
Palabras clave: Proceso escritor; orquestación; competencia comunicativa escrita; producto textual; variables psicológicas.

Abstract: We studied the timing of writing processes using a direct retrospective online technique, and differences in the textual product from the earliest school years where such a study is feasible to the final years of compulsory education. We also analysed a range of psychological variables to determine their modulating effect on writing. Participants comprised a highly purified sample of 348 students aged between 9 and 16 years old who presented standard development and average levels of curricular and writing competence. Our results reveal complex patterns in the development of the writing process and its orchestration, compared with the textual product, and no direct relationship was observed between development of the writing process and its timing, and improvement in the textual product. Among the youngest students, all this was mediated by psychological variables related to the existence of inaccurate perceptions of self-efficacy as regards the deployment and use of writing processes and causal attributions to external factors. The implications, limitations and future perspectives are discussed.
Key words: Writing process; orchestration; written communication skills; textual product; psychological variables.

Introduction

The importance of written communication skills for human development is unquestionable; writing facilitates both the transmission of knowledge and ideas and the possibility of sharing a collective philosophy and culture, representing the highest level of language (Fernández-Lozano, Puente-Ferreras and Ferrando-Lucas, 2011).

From a psychological point of view, writing is considered a highly demanding task that requires the coordinated, recursive and sometimes simultaneous application of a wide range of mental processes (Tillema, 2012). Research into the cognitive processes involved in written composition initially commenced in 1980 (Hayes and Flower, 1980), and led to proposals to move from the traditional model of writing, which described the steps taken by a writer as a linear sequence, to a model which focused on the process. As a result, the task of writing is these days categorised into three main processes which in turn are sub-divided into various actions and operations characteristic of each process. *Planning* is considered the most complex process and the one which requires most resources, since it involves brainstorming and generating ideas, and selecting and organising the relevant information - whether stored in the memory or retrieved from other, external sources - in order to accomplish the task, in addition to thinking about the target audience, the subject matter and the objective of the writing, in other words, who for, what about and with what purpose (Negro and Chanquoy, 2005). The *drafting* process basically consists of transforming these ideas into written language, whilst during the third process, *revision*, the writer assesses the text and modifies any aspects he or she considers erroneous or inconsistent with the initial plan (Alamargot and Chanquoy, 2001).

In recent years, researchers have endowed the specific study of the orchestration of the cognitive activities deployed recursively and cyclically during the writing process with particular scientific importance (Beauvais, Olive and Passerault, 2011; Olive, Alves and Castro, 2009; Tillema, Van den Bergh, Rijlaarsdam and Sanders, 2011), largely due to the crucial impact of orchestration on overall textual quality (Breetvelt, Van den Bergh and Rijlaarsdam, 1994; Sanders and Schilperoord, 2006; Tillema, 2012; Van Weijen, 2008).

The phrase "orchestration of the cognitive processes involved in writing" is used to refer to the organisation and/or timing of such processes during the task, and highlights the notion that the distribution in time of cognitive activities during the action of writing is not random; rather, the writer consciously distributes these activities throughout the writing process (Braaksma, Rijlaarsdam, Van den Bergh and van Hout-Wolters, 2004). Thus, although every writer's process would appear to be based on the same cognitive activities, regardless of the writer's characteristics, the same does not hold true as

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regards the active engagement with and orchestration of these activities or of the tasks or sub-processes that they involve during the task of textual production, where significant differences arise according to the particular characteristics of the writer. For example, the process might be more basic or, in contrast, more advanced and complex depending on an individual's level of expertise and experience in written communication skills (Ferretti, Lewis and Andrews-Weckerly, 2009).

Consequently, novice or inexperienced writers sometimes appear to initiate, implement and finalise given cognitive activities at an inappropriate moment, either sooner or later than experienced writers would (Van Weijen, 2008). The research results obtained in recent years in this field, and specifically in education, lead to various conclusions.

First, schoolchildren of all ages spend more time on the planning and drafting processes than on the revision process, generally implementing revision activities to a lesser extent (Barbeiro and Brandao, 2006). Time spent on planning, considered fundamental in the writing process due to its marked effect on the final quality of the textual product, appears to increase as students move up through the educational system (García and Fidalgo, 2008). It has also been confirmed that when this process is correctly deployed during the composition process, it results in a significant reduction in the total time devoted to the task of writing (Braaksma et al., 2004). Some of the main difficulties novice writers encounter with the planning process are related to a failure to give due importance to the role of planning in information retrieval, with the consequent failure to organise the information; to the production of irrelevant and secondary information that has a negative effect on the overall quality of the textual product; to a failure to consider the target audience, leading to difficulties in producing written texts tailored to different audiences; to a failure to define objectives; to a failure to produce first drafts or outlines, or to the production of preliminary texts which are very similar to the final written product; and to lack of knowledge about possible sources of information and strategies for finding new ideas. In short, novice writers tend not to plan their texts or they restrict themselves to generating content (Alamargot and Chanquoy, 2001; Barbeiro and Brandao, 2006).

Spelling is initially one of the main difficulties faced by novice writers during the drafting process; however, as they acquire greater command of writing skills they encounter new problems related to content, readability and textual cohesion and coherence. Besides devoting a considerable amount of cognitive resources to drafting activities, students who are inexperienced writers must also plan and revise their texts, a requirement that sometimes leads to the experience of cognitive overload (Graham, Harris and Fink, 2000).

Lastly, although research has shown that novice writers are indeed capable of carrying out the revision process, it has been found that correct revision requires a certain level of development and experience; furthermore, even where these conditions exist, most writers still pay more attention to checking aspects of form, with only partial scrutiny of their texts, and mainly limit themselves to the correction of spelling and punctuation (Harris and Graham, 2005). However, older and more experienced writers spend an increased amount of time reading the text and activate revision operations more frequently, making a greater number of revisions to the content and implementing radical and meaningful changes to the text (Alamargot and Chanquoy, 2001). Some researchers have suggested that the greatest differences between novice and experienced writers are to be found in the revision process (Roussey and Piolat, 2005), and that this is the most difficult task for any writer since it requires a high level of development in written communication skills and the operations that these imply; to revise, writers must possess a broad knowledge in order to be able to diagnose and correct textual inconsistencies or errors (Holliway and McCutchen, 2004). It should be noted that sometimes, the specific activity of reading written text may have a negative effect on the quality of the written product, depending on the precise phase in the writing process when this operation is deployed (Breetvelt et al., 1994).

At present, research has yielded a partial understanding of the key steps and patterns of thought that must occur recursively in and throughout the writing process for it to be effective as far as achieving a quality textual product is concerned; consequently, it has also generated a partial knowledge of the most effective forms of instruction, especially as regards novice writers or individuals experiencing difficulties with the task of writing (Becker, 2006). Although a considerable number of important scientific studies have been conducted on the orchestration of the writing process from a psychological and instructional perspective, research in Spain and in this context, although relevant, has been negligible. This is even more the case as regards the use of direct retrospective online techniques for evaluation (assessment during the writing task) (García and Fidalgo, 2008), whilst studies focusing on an evaluation of the differences between students from a wide range of educational levels and, therefore, with different degrees of writing experience, are nonexistent.

At this point, it should be mentioned that although the organisation and timing of cognitive activities is in itself an online characteristic (Tillema et al., 2011), much of the research has nevertheless evaluated data on the writing process which have been collected independently of the process itself, either before or after the writing task, in other words, offline. A classic approach, for example, has been the use of open-ended and closed response questionnaires, despite the strong criticism that these and other offline measurements have received in recent times. The data obtained from these tools have been defined as being an inaccurate reflection of the underlying cognitive processes

occurring in the mind of the writer, and it has been argued that they are incomplete and partially invented. In short, the use of offline measures to evaluate the writing process and its timing is currently the subject of much controversy due to the serious problems of validity, consistency and operationalisation they present (Cromley and Azevedo, 2006).

Therefore, the aim of the present study was to overcome these limitations as regards the instruments described above, and to rectify the current lack of scientific research in this field in Spain. On the one hand, we conducted an online analysis of the changes which occur in the orchestration of the written composition process over a wide range of academic years, from the earliest school years in which such a study is feasible to the final years of compulsory education. On the other hand, we also analysed the textual product in order to determine the extent to which the pattern of writing process skills affects the pattern of improvement in the written product. Our hypothesis was that an improvement in the process would translate directly into an improvement in the product as students progressed through the educational system and therefore acquired more writing experience, as has been indicated by previous research (Tillema, 2012).

In addition, we analysed several psychological variables of an affective, emotional nature in order to determine whether they had a causal and/or modulating effect on this pattern. The differences between novice and experienced writers appear to be multiple and profound in terms of their motivation, attitudes and perceptions of self-efficacy in writing (Klassen, 2004; Pajares, 2003), and this presumably becomes progressively more pronounced at higher levels of education, by which time students will have obtained considerable experience in written communication skills.

Method

Participants

The sample consisted of 348 students presenting standard academic performance and development. School years ranged from the fourth year of primary education (PE) to the third year of compulsory secondary education (CSE), and participants were aged between 9 and 16 years old; 56.03% were male and 43.09% female. This sample was selected from a total of 1170 students attending 13 schools in the province of Leon (Spain), which besides enabling us to extract the sample, facilitated validation of the assessment instruments designed or adapted for the present study.

Sample selection was based on the application of the following criteria. The first inclusion criterion was *intellectual ability*, defined here as presenting an intelligence quotient within the normal range (IQ>75). This was assessed using Scale 2 of the Spanish version of the "g" tests (Cattell and Cattell, 2001), the non-verbal nature of which reduced any possible influence of other factors such as verbal fluency, cultural level or educational climate, etc. The second

criterion was to present an *adequate level of writing skills*, assessed by setting a written composition task with no constraints on subject or length, which was then exhaustively corrected using a text correction protocol based on the indications and parameters implemented and validated in previous studies (García and Marbán, 2003; Torrance et al., 2007). Students with learning difficulties related to writing (writing performance below the average expected for their age and/or school year and QI>75) were excluded from the sample. The third inclusion criterion was to possess an *appropriate curricular level*, assessed by means of conducting interviews with teaching staff; students who presented learning difficulties in other areas or developmental disorders that might explain the limitations in the writing task and those with inadequate and/or non-standard schooling were also excluded from the sample. Lastly, we performed a final selection, excluding all students who had not been able to attend all the assessment sessions, or whose tests were incomplete or had not been completed properly.

Once all the students who met all the above requirements had been identified (N = 833), we sought to achieve a maximum inter-year sample balance, by randomly reducing the sub-samples until they presented the same size and gender ratio as the smallest group, in this case, the 2nd year of CSE (n=58). At this point, it should be noted that after the initial fieldwork, a significant imbalance was observed between PE and CSE students as regards the size of the sub-samples obtained. There was a much higher number of students in PE, both in general and presenting standard academic achievement and development, due in large part to the greater reluctance on the part of secondary education teachers to lose teaching hours in CSE, as ascertained during visits to schools in order to invite them to participate in the research.

Instruments

Online record of the writing process and its orchestration

To evaluate how students orchestrated their writing process, we adapted the writing log evaluation technique, initially employed with university students (Torrance, Thomas and Robinson, 1999) and later with school-age students, although with a smaller number of categories than in the adaptation presented in this study (García and Fidalgo, 2008). Note that this technique for assessing the writing process and its orchestration is in turn a variation on and simplification of secondary and tertiary task cognitive methodologies (Kellogg, 1987).

The writing log technique consists of recording direct and immediate retrospection on the cognitive actions and tasks performed during a writing task in a report. This activity is carried out in real time and concurrently with the writing task itself; therefore, since the data are collected in situ whilst the writing task is being performed, the technique

can be considered an online method (Van der Pool, 1996). The decision to use the writing log technique was based on the available empirical evidence indicating that it is less intrusive and interferes less with the task, and even that it is easier to analyse compared with other popular online techniques such as thinking aloud, for example (Barbier and Spinelli-Jullien, 2009; Braaksma et al., 2004).

The technique was applied as follows: prior to writing a text, each student received a log sheet divided into nine categories. Eight of these concerned writing activities, and were thus related to planning, drafting or revising a text, whilst one was unrelated to the written composition process and therefore concerned activities that did not involve written production (see Figure 1). Table 1 provides a summary of the categories associated with each of the actions and activities encompassed within the writing processes, together with the "unrelated" category. Throughout the procedure, we followed the system and technique described by Álvarez and García (2014).

Table 1. Definition of the categories of component and unrelated processes involved in the writing process.

Process	Action/Activity	Example
Planning	Reading background information	Consulting an encyclopaedia or the Internet, reading a newspaper article, etc.
	Thinking about the purpose and audience	Writing a text to convince a friend about something, for the teacher to read, etc.
	Thinking about what to write	Brainstorming, remembering something you have read or been told, looking around, etc.
	Drawing up an outline	Writing down all the ideas that have occurred to you on a separate sheet.
Drafting	Writing the text	All the moments spent writing something in the text.
Revision	Reading the text	Reading every word, sentence and paragraph that has been written, or reading through the entire text before handing it in.
	Correcting the text	Correcting presentation, misspelt words or poorly written sentences, punctuation, etc.
	Changing information	Deleting repeated or misspelt words, adding information, changing words or sentences for more appropriate ones, reorganising the information, etc.
Unrelated	Unrelated	You might be talking to a classmate, thinking about the break, looking out the window, etc.

While the students were engaged in writing a text, they were randomly exposed to an auditory signal. The mean interval between signals was 45 seconds (interval range of 45 to 120 seconds). On hearing the sound stimulus, students were required to momentarily interrupt their writing task, turn to their writing logs and indicate - by means of placing a cross in a box - the specific activity/category that they were

carrying out at the exact time when they heard the auditory signal. The students repeated this activity as many times as the auditory signal was given in the time period during which they were writing their texts. As can be seen in Figure 1, the numbers given on the log sheet corresponded to the order and number of auditory signals.
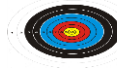
Action that I am carrying out		1 2 3 ...
Reading information		
Thinking about the purpose of the text and the target audience		
Thinking about what I'm going to write		
Drawing up an outline		
Writing the text		
Reading the text		
Correcting the text		
Changing information in the text		
Doing something unrelated		

Figure 1. Sample of the log sheet used.

Prior to commencing the writing log sessions, students were trained in its use, and the categories it contained and their meanings were explained. Furthermore, in order to determine student accuracy in categorising the activities involved in writing composition, in other words, to confirm the reliability of the technique, a pilot test was applied whereby a writer thought aloud whilst producing a text, and on the basis of what was said, students were asked to categorise 25 activities corresponding to the writer's activity at different times during the process. A comparison of the categorisation of all sampled students with that of an expert assessor yielded a *Kappa* measure of agreement of .90.

Textual product measures

Evaluation of the written product was conducted by means of a task whereby students were asked to write a text of a similar nature, subject, characteristics and level to that

written during the online evaluation of the writing process. However, in this case the students were not exposed to any kind of measurement or external intrusion while performing the task.

Two kinds of assessment measures were used (García, Fidalgo, Arias, Marbán, de Caso, Pacheco and Díez, 2014; García and Marbán, 2003; Torrance et al., 2007): 1) formal, objective text-based measures (TBM), based on the location and collation of given characteristics within the specific dimensions of productivity, coherence and structure (Bosque and Demonte, 1999, Wong, 1998), and 2) global reader-based measures (RBM), based on a reader's assessment of whether certain features within the dimensions of quality, coherence and structure were present or not in the text, and if so, to what degree (Sanders, Janssen, Van der Pool, Schilperoord and Van Dijk, 1996; De Vega, Díaz and León, 1999). Given the number and complexity of the indicators considered within each of the measures and aspects evaluated, and in order to facilitate understanding as far as possible, these are summarised in Table 2.

Table 2. Summary of measures for evaluating the textual product.

Measures	Aspects evaluated	Parameter
TBM	Productivity	Word count of the number of content, functional and determiner words.
	Coherence	Word count of seven different types of linguistic indicators (1 point if the text contained the indicator, and 0 if it did not):
	Referential	1) Anaphoric and 2) lexical.
	Relational	3) Meta-structuring, 4) structuring 5) connectors, 6) reformulation and 7) argumentative.
	Coherence (other measures)	Existence or not of the following characteristics (yes=1 point, no=0): relevance, links, coherent paragraphs and line of argument.
	Structure	1 point if the text contained the indicator and 0 if it did not: introduction, body/argument and conclusion.
RBM	Structure	Score of 1-4, based on the existence or not of: introduction, development and conclusion.
	Coherence	Score of 1-4, based on the existence or not of: definition of subject, satisfactory development, links, fluency, context and organisation.
	Quality	Score of 1-6, based on the existence or not of: sequence, detail, organisation, vocabulary, structure and mechanical aspects.

*TBM: Text-Based Measures; RBM: Reader-Based Measures.

To ensure reliability of text correction, half of the total texts without online measurement were randomly selected and then corrected independently by two experts correctors. The percentage of coefficients calculated for the indicators assessed that obtained indices of agreement between

moderate (4-6) and very good (8-1) were as follows: within the TBM, productivity 95.7%, overall coherence 96.5%, other measures of coherence 76.8% and structure 96.5%, and within the RBM, structure 98.5%, coherence 95.2% quality 97.7% of the coefficients.

Lastly, it should be noted that in order to determine whether interference of the writing log was minimal in measures of the textual product, the texts evaluated using this online technique were also corrected using the indicators within the TBM and RBM. A comparison of the results obtained for each of them with those of the texts written without online assessment indicated that there were no statistically significant differences, thus leading to the conclusion that the measurement process did not affect the level obtained in the product.

Assessment of psychological variables

To assess attitudes towards the writing task, we applied the *Attitudes towards Writing Scale* (García, Marbán and de Caso, 2001), which consists of ten statements about tastes or habits related to writing, to which the students were required to respond with yes, no or don't know, based on their degree of agreement with each of them.

To evaluate the causal attributions of success or failure in the task of writing, understood as determinants of motivation, we adapted the *Motivation for Writing Questionnaire II (MOES II)* (García et al., 2001) to the requirements and characteristics of the sample. The questionnaire consists of 32 statements to which students were required to respond by rating their degree of agreement with each of them on a scale of 1=strongly disagree to 5=strongly agree. The questionnaire yields results about the dimensions of success and failure in the writing task which, in turn, can be attributed to the following controllable/uncontrollable, stable/unstable and external/internal aspects: luck, effort, ability and task difficulty. There were therefore eight possible types of causal attribution.

Lastly, to assess self-efficacy in deployment of the cognitive processes involved in writing, we developed the *Assessment of Self-efficacy in Cognitive Processes in Writing Questionnaire (EAPCE)*, based on Bandura's guide for constructing self-efficacy scales (2006), the indications given by Pajares (2003) and previous relevant research in this field (Olive, Kellogg and Piolat, 2002). Our questionnaire consisted of 20 questions to which the students were asked to respond by rating on a scale of 1=very difficult to 7=very easy the extent to which they believed they were capable of carrying out the nine cognitive processes involved in the writing task. Prior to administering the questionnaire, we conducted a simple practical exercise in which the students were asked to imagine that they had to lift objects of different weights and use the same Likert-type scale to rate the extent to which they thought it would be easy for them to lift each of the objects, which became progressively heavier. After this exercise, the students were asked to rate

the questions about their self-efficacy in written composition.

In experimental validation, these instruments presented acceptable psychometric properties in an analysis of internal consistency, obtaining a *Cronbach's alpha* of .72, .70 and .87, respectively, for reliability. Table 3 contains examples of the statements and/or questions that comprised each of the evaluation tests employed.

Table 3. Examples of items in each of the instruments employed for assessing psychological variables related to written communication skills.

Instrument	Example items
Attitudes towards Writing Scale (García et al., 2001)	- Whenever I can, I avoid writing essays. - I try to rewrite what I've done in class to improve it.
Adapted Motivation for Writing Questionnaire II (MOES II) (García et al., 2001)	- If I try hard, I can write essays very well. - When I get a bad mark for writing, it is because the teacher is in a bad mood.
Assessment of Self-efficacy in Cognitive Processes in Writing Questionnaire (EAPCE)	- To what extent is it easy for me to express my ideas in writing in the essay? - To what extent do I find it easy to revise spelling mistakes in my essay?

Procedure

After obtaining permission from school heads, teachers and parents, all of the instruments, tests or assessment tasks described in the previous section were administered to the students in their class group and over two different sessions, each lasting approximately two hours. The students presented a complete lack of knowledge about the tasks to be performed and the instruments to complete, commencing with the same degree of motivation as with any other type of everyday school exercise.

In order to satisfactorily counterbalance the administration of each of the tests, techniques and activities, students completed the questionnaire on self-efficacy in the processes involved in the writing task in one session, and then received instruction on the online method for measuring the writing process, namely the writing log technique. After this, they wrote a text whilst completing an online log of their actions during the process of writing their text. In a second session, they were required to write a text naturally, without any intrusion during the writing process, and to complete the other relevant tests related to psychological variables.

At this point, we addressed the selection of the sample used in this study, which corresponded to students with standard academic achievement and development. The final sample was selected by means of a third evaluation session lasting approximately one hour, which was aimed at identifying different sample groups by assessing intellectual ability, writing skills and curricular levels.

Subsequently, the data were corrected and computerised, and then subject to various statistical analyses. For this, we used the *Statistical Package for the Social Sciences (SPSS),* version 17.0.

Results

Parametric techniques were used to analyse the data, since the scores the various groups obtained for the dependent variables met the skewness and kurtosis criteria for normal distribution (values between -1 and +1) and presented acceptable homoscedasticity (homogeneous variances).

Thus, we conducted multivariate analyses of variance (one-way ANOVA and *post hoc* analysis) using educational level/school year as the between-subject factor (4th, 5th and 6th years of PE and 1st, 2nd, and 3rd years of CSE), whilst the dependent variables were the scores for each of the variables assessed related to the writing process and its timing, the textual product and the psychological variables. Multivariate contrasts indicated statistically significant differences for a large number of variables, as will be described below in the following sub-sections, which also presented a large effect size ($\lambda = .035$; $F_{(525,1064)} = 1.935$; $p < .001$; $\eta^2 = .488$).

Below, we describe the differences between students at different educational levels, firstly as regards the writing process and its timing, then in terms of the textual product and, lastly with respect to the variations in a diversity of psychological variables shown by the students in their role as writers.

Orchestration of processes: online log

The results obtained for the writing process and its orchestration were analysed in terms of *activation frequency* and *percentage of time spent*. An analysis of the frequency with which the writing process was activated during text production was performed by means of counting the number of times students, on hearing the audible signal, recorded activities in their writing logs that were related to the writing task rather than to the other category included in the writing log referring to actions unrelated to written composition. The percentage of time spent on the writing process was obtained by dividing the frequency with which the writing process was activated by the number of times students recorded activities related to the writing task (excluding the category "unrelated") and multiplying the result by 100. The activation frequency of each individual activity/category considered in the writing log (eight related to the writing task and one unrelated) was calculated by counting the number of times activation of each one was recorded during written composition. The percentage of time students spent on a given activity was obtained by dividing the result for activation/presence of the activity by the writing process activation frequency, and multiplying the result by 100. Lastly, for both the writing process and each specific activity involved, we also calculated the activation

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frequency and percentage of time spent according to the timing of the process of written composition based on three different phases, in coordination with the emission of auditory signals.

First, the tests for between-subject effects, summarised in Table 4, indicated the existence of statistically significant differences between school years both for the frequency with which the writing process was activated and the percentage of time spent on the same, as well as for various specific categories within the overall process of planning (reading information, thinking about the purpose and target audience of the text, drawing up an outline). Specifically, for the frequency indicator we obtained statistically significant results for the process of drafting, in its sole category "writing text", as well as for the deployment of actions unrelated to the task of written composition. The tests for between-subject effects also yielded results with a trend towards statistical significance for the percentage of time students spent on correcting their texts, an activity encompassed within the revision process.

Table 4. Results of the analysis of between-subject tests, by school year, for the writing process and its orchestration.

	4th year PE	5th year PE	6th year PE	1st year CSE	2nd year CSE	3rd year CSE	F	p
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*		
Activation frequency								
Writing process	7.81 (3.86)	8.32 (3.99)	9.08 (4.17)	6.89 (2.61)	6.43 (2.40)	7.42 (4.49)	3.72	.003
Reading information	.70 (1.14)	.61 (1.00)	.78 (1.22)	.56 (.834)	.04 (1.87)	.22 (.418)	5.91	.001
Purpose/audience	.20 (.407)	.07 (.322)	.27 (.568)	.31 (.605)	.16 (.417)	.08 (.274)	2.56	.027
Drawing up an outline	.17 (.423)	.04 (.187)	.08 (.272)	.09 (.290)	.00 (.000)	.00 (.000)	3.52	.004
Writing the text	3.70 (2.45)	4.48 (2.89)	4.65 (3.23)	3.15 (1.63)	3.45 (1.88)	4.52 (3.82)	2.93	.013
Unrelated	.59 (.659)	.50 (.809)	.76 (.951)	1.13 (1.49)	1.52 (2.27)	1.22 (1.36)	4.58	.001
Time spent (percentage)								
Writing process	85.23 (26.06)	85.93 (28.48)	91.14 (12.34)	87.43 (15.96)	78.80 (24.37)	80.12 (23.98)	1.93	.002
Reading information	8.47 (15.11)	6.52 (10.37)	9.50 (14.79)	7.77 (10.56)	.496 (2.65)	3.80 (3.80)	5.06	.001
Purpose/audience	2.46 (5.02)	.718 (.3.23)	3.66 (8.11)	4.82 (8.93)	2.23 (5.63)	.958 (.3.45)	2.86	.015
Drawing up an outline	1.91 (4.87)	.536 (.2.96)	.741 (.2.64)	1.10 (3.87)	.00 (.000)	.00 (.000)	3.08	.010
Correcting the text	5.23 (2.23)	3.79 (6.01)	8.12 (10.89)	6.97 (9.14)	8.63 (12.25)	5.29 (9.01)	2.21	.052

*Only statistically significant results (p <.05) or results with a trend towards statistical significance are included.

The post hoc analysis of contrasts yielded several notable results. First, PE students, specifically those in their 6th year, activated writing process type activities more frequently (M_{6thPE}= 9.08 vs. M_{2ndCSE}=6.43; p <.010), and spent a greater percentage of time on deployment of the same (M_{6thPE}=91.14 vs. M_{2ndCSE}=78.80; p <.017) than, in both cases, students in their 2nd year of CSE. We found that compared with PE students, the 2nd year CSE group barely employed planning type actions such as reading information, defined as material for reference, support or source of idea generation for subsequent writing of the text: frequency (M_{2ndCSE}= .04 vs. M_{4thPE}=.70; p <.009 or M_{5thPE}=.61; p <.042 or M_{6thPE}= .78; p <0.002), percentage of time (M_{2ndCSE}=.496 vs. M_{6thPE}= 9.50; p <.006 or M_{1stCSE}=7.77; p <.03), or drawing up an outline prior to drafting the text, in this case only for the frequency indicator (M_{4thPE}=.17 vs. M_{2ndCSE}= .00; p <.033 or M_{3rdCSE}=.00; p <.043).

Turning secondly to the distribution of written composition according to different phases in the process, the tests for between-subject effects revealed the existence of statistically significant differences between school years for all phases. On the one hand, dissimilarities were observed for the activation frequency indicator in all the phases of textual production, in the drafting process, in the planning activity related to reading information and in the deployment of actions unrelated to textual production. However, statistically significant differences were only found in other actions within the planning process at specific phases in the process (for example, thinking about what to write, in the first phase of the written composition process, or drawing up an outline, during 2/3 of the auditory signals presented to the student). On the other hand, besides observing that there were generalised disparities in the percentage of time spent on the entire writing process during 1/3 of the auditory signals, we also found differences during this phase in the planning process, more specifically in the task of reading information, and in the revision process, in the action related to reading the text. In the 2nd and 3rd phases, we observed dissimilarities in tasks within the planning process, as can be seen in Table 5.

Table 5. Results of the analysis of between-subject tests, by school year, for the writing process distributed by phases.

	4th year PE M(SD)	5th year PE M(SD)	6th year PE M(SD)	1st year CSE M(SD)	2nd year CSE M(SD)	3rd year CSE M(SD)	F	p
Activation frequency (distributed in time)								
1st phase								
Reading information	.426 (.635)	.400 (.767)	.288 (.533)	.320 (.687)	.018 (.133)	.100 (.303)	4.71	.001
Thinking about what to write	.741 (.736)	.845 (.777)	.967 (.626)	.544 (.598)	.721 (.605)	.652 (.791)	5.91	.001
Writing the text	1.13 (1.01)	1.46 (.939)	1.44 (1.03)	.913 (.770)	.1.17 (.886)	1.18 (1.34)	2.39	.037
Unrelated	.241 (.422)	.127 (.318)	.269 (.468)	.535 (.779)	.430 (.685)	.742 (.959)	2.32	.043
2nd phase								
Reading information	.209 (.493)	.100 (.295)	.253 (.506)	.189 (.364)	.000 (.000)	.060 (.221)	4.00	.002
Drawing up an outline	.093 (.292)	.013 (.093)	.014 (.098)	.029 (.144)	.000 (.000)	.000 (.000)	3.13	.009
Writing the text	1.33 (1.01)	1.67 (1.26)	1.86 (1.37)	.1.32 (.821)	4.91 (1.04)	.212 (.458)	2.85	.016
Unrelated	.124 (.288)	.129 (.367)	.255 (.502)	.1.22 (.430)	.000 (.000)	.000 (.000)	3.04	.011
3rd phase								
Reading information	.067 (.356)	.109 (.295)	.243 (.641)	.055 (.229)	.018 (.133)	.060 (.221)	2.72	.020
Unrelated	.230 (.427)	.245 (.507)	.241 (.475)	.371 (.690)	.602 (.1.11)	.268 (.552)	2.53	.029
Time spent (percentage) distributed by phases								
1st phase								
Writing process	28.54 (9.09)	29.09 (9.71)	30.30 (5.80)	27.32 (8.58)	26.84 (8.58)	22.92 (11.09)	3.94	.002
Reading information	15.55 (23.54)	11.51 (19.96)	8.31 (15.69)	12.77 (26.21)	.893 (.6.68)	5.49 (18.48)	6.48	.001
Reading the text.	1.45 (6.25)	1.72 (5.89)	9.19 (4.56)	3.49 (10.57)	5.63 (15.80)	1.82 (6.48)	4.25	.001
2nd phase								
Drawing up an outline	3.19 (10.27)	.714 (5.34)	3.92 (2.80)	1.43 (7.28)	000 (.000)	000 (.000)	2.42	.036
3rd phase								
Reading information	2.67 (14.78)	4.13 (11.50)	9.12 (26.08)	2.06 (8.73)	.595 (.4.44)	2.83 (10.40)	2.27	.047

*Only statistically significant results are included ($p <.05$).

In this case, the post hoc analyses of contrast showed that in first phase, students in the first two years of PE read information that would help them to write their text, as a planning strategy, more frequently than students in their 2nd year of CSE ($M_{2ndCSE}=.018$ vs. $M_{4thPE}=.426$; $p <.014$ or $M_{5thPE}=.400$; $p <0.025$). During the second part of textual production, PE students again differed, obtaining higher scores than students in their 2nd year of CSE for the same activity ($M_{2ndCSE}=.000$ vs. $M_{4thPE}=.209$; $p <.001$ or $M_{6thPE}=.253$; $p <.021$) and in the task of drawing up an outline prior to drafting the text ($M_{2ndCSE}=.000$ vs. $M_{4thPE}=.093$; $p <.050$). Lastly, differences were only observed in the third phase for the planning activity of reading information, between students in their 2nd year of CSE and those in the final year of PE, where the latter group made more use of this activity during the last part of the written composition process ($M_{2ndCSE}=.018$ vs. $M_{6thPE}=.243$; $p <.050$). As expected, the results obtained indicated that during the first and intermediate phases of text production, the CSE students deployed actions and/or tasks unrelated to the assigned writing task more frequently than the PE students: 1st phase ($M_{1stCSE}=.535$ vs. $M_{5thPE}=.127$; $p <.050$), ($M_{3rdCSE}=.742$ vs. $M_{4thPE}=.241$; $p <.008$ or $M_{5thPE}=.127$; $p <.001$ or $M_{6thPE}=.269$; $p <.019$), and 2nd phase ($M_{2ndCSE}=.000$ vs. $M_{4thPE}=.124$; $p <.050$). Lastly, for the percentage of time indicator, we only observed the existence of statistically significant differences between students in their 3rd year of CSE and PE students, in relation to the deployment of unrelated actions and tasks, during the 1st phase of the written composition process ($M_{3rd CSE}=22.92$ vs. $M_{4thPE}=28.54$; $p <.008$ or $M_{5thPE}=29.09$; p

$<.039$ or $M_{6thPE}=30.30$; $p <.007$).

Textual product

Focusing on the results obtained from the tests of between-subject effects for the texts written by the students naturally, without any external intrusion, these indicated the existence of statistically significant differences in all the measures considered (see Table 6).

Similarly, the post hoc analyses revealed the existence of dissimilarities between school years for all indicators within the RBM and for almost all those included within the TBM. Thus, in general, as students progressed through the educational system, the textual product improved. In all cases, it was students in their final two years of CSE who produced the best textual products, in these terms, compared with all PE school years and the first year of CSE. RBM: structure ($M_{2ndCSE}=1.96$ vs. $M_{4thPE}=1.28$; $p <.001$ or $M_{5thPE}= 1.32$; $p <.001$ or $M_{6thPE}=1.35$; $p <.001$ or $M_{1stCSE}=1.38$; $p <.001$), coherence ($M_{2ndCSE}= 2.29$ vs. $M_{4thPE}= .85;p <.039$ or $M_{1stCSE}=1.67$; $p <.001$), ($M_{3rdCSE}=2.38$ vs. $M_{4thPE}=1.85$; $p <.006$ or $M_{5thPE}=1.89$; $p <.015$ or $M_{1stCSE}=1.67$; $p <.001$), quality ($M_{3rdCSE}=3.06$ vs. $M_{4thPE}=2.30$; $p <.001$ or $M_{5thPE}=2.45$; $p <.006$ or $M_{6thPE}=253$; $p <.036$ or $M_{1stCSE}= 2.31$; $p <.001$), productivity ($M_{ndCSE}=69.29$ vs. $M_{4thPE}=53.76$; $p <.029$ or $M_{5thPE}= 54.21$; $p <.035$), ($M_{1stCSE}= 51.49$ vs. $M_{2ndCSE}=69.29$; $p <.006$ or $M_{3rdCSE}=67.84$; $p <.022$), coherence ($M_{2ndCSE}=10.14$ vs. $M_{1stCSE}= 6.60$; $p <.016$), other measures of coherence ($M_{2ndCSE}=2.86$ vs. $M_{1stCSE}= 2.24$; $p <.001$), and structure ($M_{2ndCSE}=1.52$ vs. $M_{1stCSE}=1.04$; $p <.023$).

Table 6. Results for the analysis of between-subject tests, by school year, for the textual product.

	4th year PE M(SD)	5th year PE M(SD)	6th year PE M(SD)	1st year CSE M(SD)	2nd year CSE M(SD)	3rd year CSE M(SD)	F	p	η^2
RBM									
Structure	1.28 (.564)	.1.32 (.543)	.1.35 (.522)	.1.38 (.527)	1.96 (1.00)	.1.60 (.782)	8.05	.001	.113
Coherence	1.85 (.563)	.1.89 (.679)	.2.00 (.632)	.1.67 (.511)	.2.29 (.847)	.2.38 (.667)	8.95	.001	.124
Quality	2.30 (.717)	.2.45 (.737)	.2.53 (.703)	.2.31 (.573)	2.77 (1.00)	.3.06 (.793)	7.76	.001	.109
TBM									
Productivity	53.76 (18.24)	54.21 (23.25)	54.90 (14.40)	51.49 (18.37)	69.29 (26.82)	67.84 (30.19)	6.31	.001	.091
Overall coherence	8.28 (4.71)	8.20 (5.35)	7.67 (4.01)	6.60 (3.50)	10.14 (6.24)	9.16 (5.25)	3.33	.006	.050
Coherence (other measures)	2.35 (.619)	2.54 (.808)	2.63 (.774)	2.24 (.508)	2.86 (.841)	2.78 (7.64)	5.93	.001	.086
Structure	1.11 (.420)	1.11 (.312)	1.14 (.401)	1.04 (.189)	1.52 (.853)	1.44 (1.34)	4.52	.001	.067

*Only statistically significant results are included ($p < .05$); η^2 (eta-squared statistic) = estimates of effect size. Cohen's rule (1988) states that .01-.06 (small effect); > .06-.14 (medium effect); > .14 (large effect). TBM: Text-Based Measures; RBM: Reader-Based Measures.

Psychological variables of the writer

As regards the psychological variables related to written communication skills, it should be noted that in this case, the tests for between-subject effects revealed the existence of differences in variables within the three constructs considered: attitudes towards writing, causal attributions of success or failure in the writing task success and lastly, self-efficacy in writing processes, as can be seen in Table 7.

Table 7. Results of the analysis of between-subject tests, by school year, for psychological variables related to written communication skills.

	4th year PE M(SD)	5th year PE M(SD)	6th year PE M(SD)	1st year CSE M(SD)	2nd year CSE M(SD)	3rd year CSE M(SD)	F	p	η^2
Attitudes towards writing									
Total attitudes	21.72 (4.39)	21.34 (3.64)	21.37 (4.42)	20.25 (4.55)	19.27 (4.45)	20.06 (4.22)	2.69	.021	.041
Causal attributions									
Success attributed to ability	12.33 (3.32)	12.59 (2.78)	12.18 (2.55)	10.04 (2.49)	12.89 (2.71)	11.12 (3.33)	3.87	.002	.058
Success attributed to easiness of task	14.39 (3.06)	14.93 (3.58)	13.69 (3.32)	12.44 (2.93)	12.37 (2.74)	12.20 (3.67)	7.06	.001	.101
Success attributed to luck	7.41 (3.70)	7.91 (3.90)	6.86 (3.35)	7.36 (3.10)	8.32 (3.51)	6.88 (2.45)	3.29	.006	.050
Failure attributed to effort	9.44 (3.15)	10.25 (3.71)	10.63 (3.70)	10.35 (3.56)	11.89 (3.43)	11.30 (3.58)	3.21	.008	.048
Self-efficacy in writing processes									
Thinking about audience	10.43 (2.41)	11.54 (1.71)	10.00 (2.10)	10.45 (2.13)	10.50 (2.05)	10.16 (2.29)	3.48	.004	.052
Drawing up an outline	10.17 (2.50)	10.02 (3.14)	9.80 (2.29)	9.20 (1.92)	8.82 (2.48)	7.34 (2.91)	9.64	.001	.120
Reading text	11.24 (2.24)	12.18 (1.98)	11.24 (2.78)	10.78 (2.04)	11.36 (1.99)	10.78 (2.18)	2.93	.013	.044

*Only statistically significant results are included ($p < .05$); η^2 (eta-squared statistic) = estimates of effect size. Cohen's rule (1988) states that .01-.06 (small effect); > .06-.14 (medium effect); > .14 (large effect).

In this respect, the post hoc contrasts revealed the existence of statistically significant differences between school years in two of the three constructs considered: causal attributions of success or failure in the writing task and self-efficacy in writing processes.

Turning first to the causal attributions made by the students, there are several issues to be addressed. First, as regards the causal attributions made by the students about their success in the writing tasks, PE students attributed writing success to external, stable and controllable causes to a greater extent than did CSE students: easiness of the task ($M_{5thPE}=14.93$ vs. $M_{1stCSE}=12.44$; $p < .006$ or $M_{2ndCSE}=12.37$; $p < .004$ or $M_{3rdCSE}=12.20$; $p < .038$), ($M_{4thPE}=14.39$ vs. $M_{3rdCSE}=12.20$; $p < .002$), as well as to other external, but unstable and uncontrollable causes: luck ($M_{4thPE}=7.41$ vs. $M_{3rdCSE}=6.88$; $p < .025$). The opposite trend was observed in relation to failure, which was attributed to an internal, unstable but controllable factor, such as effort, and where it was CSE students, and more specifically, those in their 2nd year, who obtained the highest score, differing in particular from students in their 4th year of PE ($M_{2ndCSE}=11.89$ vs.

$M_{4thPE}=9.44$; $p < .023$). Lastly, it was the 2nd year CSE students who to the greatest extent attributed writing success to ability, understood as something internal, stable and uncontrollable ($M_{2ndCSE}=12.89$ vs. $M_{4thPE}=10.04$; $p < .045$).

Focusing lastly on students' perceptions of self-efficacy in the use and development of writing processes, the post hoc analyses confirmed that it was the 4th and 5th year PE students who perceived the most self-efficacy in the deployment of activities within the planning process during a written composition task, such as thinking about the target audience ($M_{5thPE}=11.54$ vs. $M_{6thPE}=10.00$; $p < .018$ or $M_{3rdCSE}=10.45$; $p < .050$) and drawing up an outline ($M_{3rdCSE}=7.34$ vs. $M_{4thPE}=10.17$; $p < .001$ or $M_{5thPE}=10.02$; $p < .001$ or $M_{6thPE}=9.80$; $p < .001$ or $M_{1stCSE}=9.20$; $p < .020$).

Discussion and conclusions

The goal of the conclusions presented below is to provide a source of theoretical and practical information to further the online study of the cognitive processes involved in writing.

Our conclusions also have educational implications for education professionals, who tend to view writing as a challenging task involving the deployment and control of multiple cognitive resources and conditioned by diverse psychological factors (Olive, Favart, Beauvais and Beauvais, 2009), endowing it with its the true relevance, as recognised in Spain in Organic Law 2/2006 on Education (LOE). Likewise, our findings support various conclusions about the orchestration of the writing process in students of different ages and levels of experience and writing, and therefore, about the difficulties that inexperienced or novice writers may face.

Thus, it should first be noted that compared with CSE students, PE students devoted more time to the task of textual composition, and unexpectedly, their performance of the task did not appear to be accompanied by a greater number of interruptions during the process. It was also these students who activated productive writing actions most frequently, especially actions of very different complexity within the planning process, such as reading background information and drawing up an outline. To some extent, these preliminary results contradict the widespread belief that the more time devoted to writing a text, the greater the number of interruptions there will be during the writing process (García and Fidalgo, 2008), and that engagement with planning activities will increase as students progress through the educational system and acquire more experience of writing (Barbeiro and Brandao, 2006). However, given the results obtained for the textual product, these results should be interpreted with caution, since there does not appear to be a noticeable effect on improving the textual product given that it was the CSE students who produced texts of a higher quality overall.

Looking more closely at the PE students' engagement in the process of written composition, and more specifically at tasks characteristic of the planning process, it is noteworthy that in both cases, it was the PE students who made most use of these, despite their variable complexity. In this regard, it was to be expected that PE students, who apparently possessed little or no knowledge about a diversity of subjects or discourse (González, 2003), devoted more time and frequency to reading background information; however, this was not the case for drawing up an outline, a task which requires a certain degree of self-regulation that can only be achieved through experience of writing (De Milliano, Van Gelderen and Sleegers, 2012). Perhaps these results reflect the current trend - prompted by past criticisms that schools have had to face in relation to their conception of writing as a global skill based on aspects of a formal nature (grammar, punctuation, spelling, etc,) - towards extensive teaching of the processes underlying the writing task, which requires reflection on the what, how and why of writing, in other words, instilling a writing style in students which is based on planning, also referred to as an "engineering" approach (Biggs, Lai, Tang and Lavelle, 1999). Although planning has a close relationship with writing achievement (Galbraith and

Torrance, 2004; Kieft, Rijlaarsdam and Van den Bergh, 2008; Troia and Graham, 2002), it is not a sufficient condition for success (Torrance et al., 1999). It is widely recognised that competent writers do not complete their texts at the first attempt but write successive versions until the final version is produced, employing a process which involves the revision of both mechanical and substantive aspects (Alamargot and Chanquoy, 2001). In sum, during the process of consolidating writing skills - in other words, during primary education - an excessive instructional emphasis on specific strategies and techniques for addressing the planning process can lead to a situation where students are prematurely introduced to certain planning activities despite not possessing sufficient cognitive development to understand the tasks, or the skills necessary to use and implement them correctly. In this circumstance, they devote more time than is necessary to these activities, activating them too frequently and also inappropriately during the writing process, and this in turn affects the quality of the resulting textual product (Van Weijen, 2008). Such would appear to have been the case in the present study; when the timing of the writing process was analysed by phases, we observed that during all three phases, PE students activated planning activities with greater frequency and for more time. Although these activities initially have a positive relationship with overall text quality, this becomes negative as the written composition process progresses (Rijlaarsdam and Van den Bergh, 1996).

At this point, it should be noted that it was not possible to extract statistically significant data on the writing process and its orchestration during the second and third phases, for the processes of drafting and revising a text, and it is therefore impossible to state what type of cognitive activities were differentially initiated and implemented by students from different educational levels (Van Weijen, 2008). We hope to address this question in future research, through the use of more sensitive direct retrospective online measures. The impossibility of determining the existence of differences between writers from different educational levels as regards their degree of engagement with cognitive actions specific to the process of text revision may be the result of developmental aspects. Revision tends to appear later than planning, and even students at higher levels encounter serious difficulties in revising thoroughly; rather than rewriting their texts, they limit themselves to making partial copies (Harris and Graham, 2005). It may also be due to attitudinal factors: if a student devotes a considerable amount of time to other types of task, for example planning, he or she might subsequently be reluctant to make changes to the text (Becker, 2006). It might also be a consequence of the present trend in education discussed earlier to teach writing based on planning.

The results obtained from an evaluation of various psychological factors indicate that these have a modulating effect on textual quality, following the same trend as the results obtained for the written product. Firstly, in relation

to the causal attributions made by the students about their success, the CSE students, whose written performance was superior to that of the PE students, attributed their success in the writing task to an internal, stable and uncontrollable cause, such as their own ability, to a greater extent than PE students, an attribution that increases expectations of future success since the students perceive themselves as always being capable of performing the task, and are therefore more motivated. Similarly, the CSE students attributed their failures in writing tasks to effort, an attribution which is actually positive because this variable is unstable and can therefore be modified if so desired (because of its internal nature), and depends on self-control (De Caso, García Díez, Robledo and Álvarez, 2010). In contrast, PE students were more likely to attribute their success in writing tasks to external factors such as luck or easiness of the task, assuming less responsibility for their actions, attributions which lower their motivation and performance as writers (Valle, Núñez, Rodríguez and González-Pumariega, 2002).

Lastly, our assessment of students' self-efficacy in the use and management of writing processes showed that compared with CSE students, PE students perceived themselves to be more effective at performing various planning tasks. This perception was reflected in the nature and orchestration of their writing process, characterised by the widespread use of tasks of a basically planning nature which, as noted above, did not appear to have a positive effect on the written product; although they perceived themselves as effective, this did not necessarily mean that they were. In this respect, research in this field has indicated that even students with learning difficulties in writing perceive themselves to be equally or even more effective at the task of written composition, compared with their peers without difficulties (García and Fidalgo, 2008).

Based on the foregoing, although CSE students produced better textual products and presented a better writing performance, confirming the modulatory effect that a diversity of psychological factors exert on such performance, the results obtained at the process level are contradictory. Thus, it was the PE students, with less experience in written communication skills, who showed greater apparent engagement with the writing process, although as previously noted, this did not occur in the most appropriate form and might not even be the case. At this point, the question arises of why we were unable to obtain statistically significant data on the writing process for CSE students, when compared with PE students these must have deployed a much more advanced and complex writing process (Ferretti et al., 2009), distributing the actions and activities encompassed within the writing processes more efficiently in time throughout the entire writing process (Braaksma et al., 2004). One possible explanation for this may be the typical behaviour of pre-adolescent and adolescent students, who are at a stage of marked affective

and emotional vulnerability and instability (Barca-Lozano, Almeida, Porto-Rioboo, Peralbo-Uzquiano and Brenlla-Blanco, 2012; Cerezo and Méndez, 2012). This may have influenced their engagement with an assessment task such as the writing log that offers no academic compensation but requires a high degree of attention and effort, leading to reduced and only partial engagement with the exercise. Thus, the need arises to endeavour in the future to develop and create online instruments for assessing the writing process that students will regard as informal and enjoyable, far removed from the complexity that written communication skills attain at higher educational levels. Leveraging the rise in recent decades of the new information and communication technologies, an area of considerable interest to adolescent students, issues related to the use of technological resources and formats should be considered for inclusion in the assessment and instruction of written communication skills as a process, given that outside the school context and also increasingly within it, most texts are produced using technological devices. Although the general characteristics of the cognitive activities underlying written composition are essentially the same, these new contexts create challenges for research in relation to the study and development of new opportunities for online assessment of writing behaviour (see Latif, 2009).

In short, our results indicate complex patterns of development of the writing process and its orchestration, compared with the written product and psychological variables. An improvement in the writing process does not directly translate into an improved textual product; the situation is mediated to a large extent by the writer's psychological variables. Students at lower educational levels held inaccurate perceptions of self-efficacy and made causal attributions of success to external factors, indicating that there is no direct relationship between process and product. As regards the teaching of skills such as writing, which makes high cognitive demands (Fernández-Lozano et al., 2011), it would be highly desirable in the future to implement interventions with teachers (Merino-Tejedor, 2013) which would enable them to incorporate the constructs of process and product into their instruction in unison, as well as affective aspects related to personality and other contextual and educational factors (Hombrados-Mendieta and Trave-Castro, 2013) that are determinants of both the learning process in general, and the specific learning process related to written communication skills.

References

Alamargot, D. y Chanquoy, L. (2001). *Through the models of writing.* Holland: Kluwer Academic Publishers Dordrecht.

Álvarez, M. L. y García, J. N. (2014). Evaluación on-line de los procesos cognitivos implicados en la composición escrita. En J. N. García (Coor.,), *Instrumentos y programas de actuación en dificultades del desarrollo y del aprendizaje (pp. 373-392).* Madrid: Pirámide

Bandura, A. (2006). Guide for constructing self-efficacy scales. En F. Pajares and T. Urdan (Eds.), *Self-Efficacy beliefs of adolescents* (pp. 307-337). Greenwich, CT: Information Age Publishing.

Barbeiro, L. y Brandao, J. A. (2006). Enseñar a aprender a escribir en la escuela: Algunas líneas de investigación. En A. Camps (Coord.), *Diálogo e investigaciones en las aulas.* Barcelona: Graó.

Barbier, M. L. y Spinelli-Jullien, N. (2009). On-line tools for investigating writing strategies in L2. *German as a Foreign Language Journal, 2-3*, 23-40.

Barca-Lozano, A., Almeida, L. S., Porto-Rioboo, A. M., Peralbo-Uzquiano, M. y Brenlla-Blanco, J. C. (2012). Motivación escolar y rendimiento: Impacto de metas académicas, de estrategias de aprendizaje y autoeficacia. *Anales de Psicología, 28*(3), 848-859.Doi: http://dx.doi.org/10.6018/analesps.28.3.156221.

Beauvais, C., Olive, T. y Passerault, J. M. (2011). Why are some texts good and others not? Relationship between text quality and online management of the writing processes. *Journal of Educational Psychology, 103,* 415-428. Doi: 10.1037/a0022545.

Becker, A. (2006). A review of writing model research based on cognitive processes. En A. S. Horning y A. Becker (Eds.), *Revision: History, theory, and practice* (pp. 25-49). West Lafayette, Indiana: Parlor Press.

Bigg, J., Lai, P., Tang, C. y Lavelle, E. (1999). Teaching writing to ESL graduate students: A model and illustration. B*ritish Journal of Educational Psychology, 69*, 293-306.

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

Braaksma, M. A. H., Rijlaarsdam, G., Van den Bergh, H. y van Hout-wolters, B. (2004). Observational learning and its effects on the orchestration of writing processes. *Cognition and Instruction, 22*(1), 1-36. Doi: http://www.jstor.org/stable/3233849.

Breetvelt, I., Van den Bergh, H. y Rijlaarsdam, G. (1994). Relations between writing processes and text quality: when and how? *Cognition and Instruction, 12*(2), 103-123. Doi: http://www.jstor.org/stable/3233677.

Cattell, R. y Cattell, A. (2001). *Manual de factor "g", escalas 2 y 3.* Madrid: TEA Editions.

Cerezo, F. y Méndez, I. (2012). Conductas de riesgo social y de salud en adolescentes. Propuesta de intervención contextualizada para un caso de bullying. *Anales de Psicología, 28*(3), 705-719.Doi: http://dx.doi.org/10.6018/analesps. 28.3.156001.

Cromley, J. G. y Azevedo, R. (2006). Self-reports of reading comprehension strategies. What are we measuring? *Metacognition and Learning, 1*, 229-247. Doi: 10.1007/s11409-006-9002-5.

De Caso, A. M., García, J. N., Díez, C., Robledo, P. y Álvarez, M. L. (2010). Mejorar las creencias de autoeficacia para la escritura de los alumnos con dificultades de aprendizaje para mejorar también sus procesos y productos de escritura. *Electronic Journal of Research in Educational Psychology, 8*, 195-206.

De Milliano, L. L., Van Gelderen, A. y Sleegers, P. (2012). Patterns of cognitive self-regulation of adolescent struggling writers. *Written Communication, 29*(3), 303-325. Doi:10.1177/0741088312450275.

De Vega, M., Díaz, J. M. y León, I. (1999). Procesamiento del discurso. En M. De Vega y F. Cuetos (Eds.), *Psicolingüística del español* (pp. 271-305). Madrid: trotta.

España. Ley Orgánica 2/2006, de 3 de mayo, de Educación. *Boletín Oficial del Estado*, 4 de mayo de 2006, núm. 106.

Fernández-Lozano, M. P., Puente-Ferreras, A. y Ferrando-Lucas, M.T. (2011). Lectura y escritura en niños con síndrome x frágil: estrategias de intervención. *Anales de Psicología, 27*(3), 808-815.

Ferretti, R. P., Lewis, W. E. y Andrews-Weckerly, S. (2009). Do goals affect the structure of students' argumentative writing strategies*? Journal of Educational Psychology, 101*(3), 577-589. Doi: 10.1037/a0014702.

Galbraith, D. y Torrance, M. (2004). Revision in the context of different drafting strategies. En L. Chanquoy, L. Allal, y P. Largy (Eds.), *Revision in writing.* Dordrecht, NL: Kluwer Academic Publishers.

García, J. N. y Fidalgo, R. (2008). Orchestration of writing processes and writing products: a comparison of sixth-grade students with and without learning disabilities. *Learning Disabilities: A Contemporary Journal, 6*(2), 77-98.

García, J. N., Fidalgo, R., Arias, O., Marbán, J. M., de Caso, A. M., Pacheco, D. I.

y Díez, H. (2014). El análisis psicolingüístico del product textual. En J. N. García (Coor.,), *Instrumentos y programas de actuación en dificultades del desarrollo y del aprendizaje (pp. 313-334).* Madrid: Pirámide

García, J. N. y Marbán, J. (2003). El proceso de composición escrita en alumnos con DA y/o BR: estudio instruccional con énfasis en la planificación. *Infancia y Aprendizaje, 26*(1), 97-113.

García, J. N., Marbán, J. y de Caso, A. (2001). Evaluación colectiva de los procesos de Planificación y Factores Psicológicos en la composición escrita (EPP y FPE). En J. N. García (Ed.), *Dificultades de aprendizaje e intervención psicopedagógica* (pp. 151-155). Barcelona: Ariel.

González, R. M. (2003). Una propuesta de intervención en los procesos cognitivos y estructuras textuales en niños con DAE. *Psichotema, 15*(3), 458-463.

Graham, S., Harris, K. R. y Fink, B. (2000). Is handwriting causally related to learning to write? Treatment of handwriting problems in beginning writers. *Journal of Educational Psychology, 92*(4), 620-633.

Harris, K. y Graham, S. (2005). *Writing better: effective strategies for teaching students with learning difficulties.* Baltimore: Paul H. Brookes Publishing.

Hayes, J. R. y Flower, L. S. (1980). Identifying the organization of writing processes. En L. W. Gregg and E. R. Steinberg (Eds.), *Cognitive processes in writing: An interdisciplinary approach* (pp. 3-30). Hillsdale, N. J.: Lawrence Erlbaum Associates.

Holliway, D. R. y McCutchen, D. (2004). Audience perspective in young writers´ composing and revising. Reading as the reader. En L. Allal, L. Chanquoy, y P. Largy. (Eds.), *Studies in writing: vol.13. Revision: Cognitive and instructional processes* (pp.87-101). Norwell, M. A: Kluwer.

Hombrados-Mendieta, I. y Castro-Travé, M. (2013). Apoyo social, clima social y percepción de conflictos en un contexto educativo intercultural. *Anales de Psicología, 29*(1), 108-122. Doi: http://dx.doi.org/10.6018/analesps.29.1.1233 11

Kellogg, R. (1987). Writing performance: Effect of cognitive strategies. *Written Communication, 4*, 269-298.

Kieft, M., Rijlaarsdam, G., y Van den Bergh, H. (2008). An aptitude-treatment interaction approach to writing to-learn. *Learning and Instruction, 18*(4), 379-390.

Klassen, R. (2004). Optimism and realism: A review of self-efficacy from a cross-cultural perspective. *International Journal of Psychology, 39*(3), 205-230. Doi: 10.1080/00207590344000330.

Latif, M. (2009). A state-of-the-art review of the real-time computer-aided study of the writing process. *International Journal of English Studies, 8*(1), 29-50.

Merino-Tejedor, E. (2013). Análisis de la validez de la escala de irritación en una muestra de profesores de educación primaria: Un estudio exploratorio. *Anales de Psicología, 29*(1), 123-130. Doi: http://dx.doi.org/10.6018/analesps.29.1. 1891.

Negro, I. y Chanquoy, L. (2005). The effect of psycholinguistics research on the teaching of writing. *Educational Studies in Languages and Literature, 5*, 105-111.

Olive, T., Alves, R. A. y Castro, S. L. (2009). Cognitive processes in writing during pauses and execution periods. *European Journal of Cognitive Psychology, 21*, 758-785.

Olive, T., Favart, M., Beauvais, C. y Beauvais, L. (2009). Children`s cognitive effort and fluency in writing: effects and genre and of handwriting automatisation. *Learning and Instruction, 19*(4), 299-308. Doi: http://dx.doi.org.proxy.library.vanderbilt.edu/10.1016/j.learninstruc.2008.0 5.005,

Olive, T., Kellogg, R. T. y Piolat, A. (2002). The triple task technique for studying the process of writing. En T. Olive y C. M. Levy (Eds.), *Contemporary tools and techniques for studying writing* (pp. 31-61). Dordrecht, A. A.: Kluwer Academic Publishers.

Pajares, F. (2003). Self-efficacy beliefs, motivation, and achievement in writing: A review of the literature. *Reading & Writing Quarterly, 19*(2), 159-172. Doi: 10.1080/10573560308222.

Rijlaarsdam, G. y Van den Bergh, H. (1996). The dynamics of composing an agenda for research into an interactive compensatory model of writing: many questions, some answers. En C. M. Levy y S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences y applications* (pp. 107-125). Mahwah, NJ: Lawrence Erlbaum Associates.

Roussey, J. Y. y Piolat, A. (2005). Lé revision du text: une activité de contrôle et de réflexion. *Psychologie FranÇaise, 50*(3), 351-372. Doi: 10.1016/j.psfr.2005.05.001.

Sanders, T. J., Janssen, D., Van der Pool, E., Schilperoord, J. y Van Wijk, C. (1996). Hierarchical text structure in writing products and writing processes. En G. Rijlaarsdam, H. Van den Bergh, y M. Couzijn (Eds.), *Theories, models*

and methodology in writing research (pp. 473-492). Amsterdam: Amsterdam University Press.

Sanders, T. J. y Schilperoord, J. (2006). Text structure as a window on the cognition of writing. En C. MacArthur, S. Graham, y Fitzgerald, J. (Eds.), *Handbook of writing research* (pp. 357-402). New York: The Guilford Press.

Tillema, M. (2012). *Writing in first and second language: empirical studies on text quality and writing processes* (Doctoral thesis, Netherlands Graduate School of Linguistics, Utrecht University). Recuperado de http://igitur-archive.library.uu.nl/dissertations/2012-0525-200513/UUindex.html.

Tillema, M., Van den Bergh, H., Rijlaarsdam, G. y Sanders, T. (2011). Relating self-reports of writing behaviour and online task execution using a temporal model. *Metacognition and Learning, 6*(3), 229-253. Doi: 10.1007/s11409-011-9072-x.

Torrance, M., Fidalgo, R. y García, J. (2007). The teachability and effectiveness of cognitive self-regulation in sixth-grade writers. *Learning and Instruction, 17*(3), 265-285. doi:10.1016/j.learninstruc.2007.02.003.

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

Troia, G. A. y Graham, S. (2002). The effectiveness of a highly explicit, teacher-directed strategy instruction routine: Changing the writing performance of students with learning disabilities. *Journal of Learning Disabilities, 35*(4), 290-305. Doi: 10.1177/00222194020350040101.

Valle, A., Núñez, J. C., Rodríguez, S. y González-Pumariega, S. (2002). La motivación académica, En J. A. González-Pienda, R. González-Cabanach, J. C. Núñez y A. Valle (Coords.), *Manual de psicología de la educación* (pp. 117-144). Madrid: Pirámide.

Van der Pool, E. (1996). A text analytical study of conceptual writing processes and their development (pp. 456-472). En G. Rijlaarsdam, H. Van den Bergh, y M. Couzijn (Eds.), *Theories, models and methodology in writing research*. Amsterdam: Amsterdam University Press.

Van Weijen, D. (2008) *Writing processes, text quality, and task effects. Empirical studies in first and second language writing.* Utrecht: LOT.