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Resolving L2 written text production problems using reference sources

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Abstract

Little attention has been paid to reference skills in L2 written text production in comparison with L2 text comprehension. This may be explained by the fact that the relation between L2 text production and the process of consultation of external resources has not yet been the object of exhaustive research, largely because text production is viewed exclusively as an encoding activity. The place of the consultation of external resources in text production will only be recognised when the latter is viewed as an encoding activity continuously interrupted by decoding sequences when internal support fails and additional information is required. To obtain this additional information, writers must turn to external resources and engage in decoding. The consultation of external resources is thus a conscious problem-solving strategy which is closely related to one's definition of a problem, knowledge and beliefs about external resources, and attitude towards their use.

In this article we present a cognitive model of the problem-solving process in L2 text production which includes the use of reference sources. Using this model, we have analysed how students envisage, and carry out, their problem-solving processes in L2 written text production. A customised questionnaire was used to obtain data on students' beliefs concerning the relation between internal and external support; their perceived knowledge of external resources; and their attitude to reference skills training. This data was contrasted to the problem-solving processes actually carried out by the students. Results suggest that, in theory, students correctly describe the stages of the consultation process. In practice, however, some fail to complete the process at a certain stage. Detecting when this happens allows us to design appropriate reference skills training.

Key words: text production, L2, reference skills, dictionary, problem-solving

1. Introduction

The fact that L2 text production makes greater information demands and requires more intensive use of external resources than L1 text production has been well established in Translation Studies research (Krings 1986, Gerloff 1988, Jääskeläinen 1989, 1996, Kiraly 1995, Fraser 1996, Varantola 1998, Künzli 2001, Palomares Perraut 2001, Cummins and Desjardins 2002, Nord 2002, Pym 2003, Sánchez Ramos 2004, PACTE 2005, 2009, Enríquez Raído 2014). Researchers have long found that bilingual dictionaries are perceived by translators to be “friendly tools” (Krings 1986, Gerloff 1988) and used mostly for text production purposes (Gerloff 1988). Dictionary format would appear to matter little or not at all as long as translators can use familiar resources (PACTE 2009). Rather, as Varantola (1998: 188) suggests, it is “user skills” that “determine the ultimate success or failure of the dictionary use”. Instead of focusing on dictionary limitations, translators think of a bilingual dictionary as an index that connects two languages (Steiner 1989: 249) —in line with Ianucci (1957: 278) who suggests that a bilingual dictionary should have a monolingual dictionary “as its partner”, and Zgusta (1971) who speaks of “coordinating” lexical units.

If we accept the notion of a dictionary as an index and apply it to the context of L2 text production, we find that both bilingual and monolingual dictionaries may be considered to be indexes. What varies is the language of the access key that the user is able to generate, which can be either an L1 or an L2 element depending on the user’s L2 language level. This explains why students with limited knowledge of L2 base their consultations on L1 elements and thus prefer a bilingual to a monolingual dictionary or, with the advent of electronic dictionaries, bilingual to monolingual mode, being able to switch from one another with just a click. Our challenge today (as earlier stated in Kozlova and Presas 2013) is to make students aware of their information lags and teach them how to obtain the information they require by using whatever access key (L1 or L2) they are able to generate as their starting point.

The theoretical basis for the study we present is a cognitive model of problem solving at work in L2 text production that integrates the use of external resources. A description of the model we

propose is followed by a description of the study design, and the presentation of our findings. Didactic implications for dictionary skills training within the context of L2 production are then discussed.

2. Research on dictionary use for production purposes

Much has been published on dictionary use and user's skills in relation to reading *comprehension*. Exhaustive surveys of reports on research and reviews of the literature on the subject have been published (Nesi 2000, Tono 2001). In contrast to the abundance of research on dictionary use in reading comprehension there is a critical shortage of similar studies on L2 *text production*. Reference to dictionary use in text production in studies by Ard (1982) and Christianson (1997) was pursued no further, but instead was used to feed the bilingual versus monolingual dictionary debate. In a paper with the promising title "Dictionary skills in production" Rundell (1999) blamed bilingual dictionaries for nurturing "the perception that a source and a target language are broadly isomorphic" thus contributing to an old stigma attached to the bilingual dictionary by a series of authors such as Baxter (1980) or Snell-Hornby (1986). It should be taken into account that the aim of Rundell's article was to present a series of improvements to the bilingual dictionary. However, in the L2 context, as well as in translation research, it has already been observed that production accuracy depends on the sophistication of the user rather than on the type of dictionary used, i.e. those students who read example sentences and relate them to the writing task make fewer mistakes, while the type of dictionary used plays a minor role (Kipfer 1987, Christianson 1997). What capture our attention in Rundell's article are the examples of the dictionary use for production purposes, which are mainly multiple choice exercises. It makes us suggest that the dictionary best works in the productive tasks that combine comprehension and production: translation (as described earlier), correcting mistakes in revision (Kozlova 2007), or multiple choice exercises (Rundell 1999).

Somewhere else we have already analysed the relevant literature and highlighted the existing clash between teachers' and students' attitudes towards the dictionary use (Kozlova and Presas 2013) that dues itself to the cyclical nature of the writing process. While teachers dissuade

students from writing “with a dictionary at hand” (Chastain 1976: 377, Christianson 1997) and rather recommend students to “write it down, even if flawed, and revise it later” (Chenoweth and Hayes 2001: 96), students seem to detect problems at any stage of the process: a) while planning, i.e. before starting their writing, b) during writing, c) while revising their draft, and consequently may need the help of resources at any stage of the process. We coincide with Chon (2009:29) that in order to know how to improve the use of resources for production purposes it is necessary to study “the cognitive process of using dictionaries in L2 writing”. We agree that research on dictionary use conducted up to now has not paid enough attention to the relation between internal and external support in text production. In fact, there is a dearth of studies on what is generally referred to as dictionary skills in L2 text production, how writers define their problems, and how this information is related to information retrieval from external sources. Our paper aims at bridging this gap, bringing together relevant studies on problem-solving processes in L2 text production and memory research.

3. L2 text production as a problem-solving process

Authors studying composition in general have focused on different stages of the process of text production and have approached the subject from cognitive, communicative, social and technological perspectives. Within the cognitive paradigm, we will trace the influence of the ideas expressed by Mel’čuk (1974) and Flower and Hayes (1981, Flower et al. 1986). Mel’čuk (1974: 198) described text creation in terms of options and filters through which these options must pass. Flower and Hayes (1981) proposed a cognitive process theory of writing in which they referred to “distinctive thinking processes” that the writer has to organize provided that “any given process can be embedded within any other” (Flower and Hayes 1981: 366). They also suggested viewing composition as a process aimed at resolving a rhetorical problem through an expanding network of goals.

Various authors contributed to modelling L2 text production using Flower and Hayes’ model as a starting point, among them Zimmermann (2000) whose data suggested the importance of tentative formulations similar to Mel’čuk’s options. Pym (2003: 489), within the context of

Translation Studies, proposed interpreting the process of translation - a variety of written text production - in terms of the generation and selection of tentative options. When modelling the text production process we will focus first on the encoding process of writing. One could see text production as encoding, a process which relies exclusively on internal resources (internal support) to generate linguistic options that will later have to pass a norms filter (Mel'čuk 1974: 198, Zimmermann 2000: 86, Pym 2003: 489).

This view of text production as encoding is, however, incomplete. The production task, in cognitive science, can be viewed as a global problem to be resolved (Presas 1997). This requires an effort from the user to produce several tentative options as solutions to this problem and to select the most adequate, according to the production task norms, to be used as output. As a general tendency, the individual attempts to optimize completion of the task. On the one hand, s/he attempts to carry out the task in a limited amount of time, minimizing his/her effort. On the other, s/he has a certain idea of the expected quality of the final product as part of his/her task-based competence. Norms that form this competence are intrinsically related to the task; they go back to previous experiences and are subject to modification through feedback or previous instruction.

In fact, optimization is probably not the best term to describe what takes place in the writer's memory. As Jääskeläinen (1996: 72) comments in her study, due to the limited capacity of working memory 'human beings are satisfiers', i.e. making decisions "people accept a choice that is good enough rather than continuing to search for one that is the best possible" (Howard 1983: 424, quoted *ibid.*). Thus the global problem posed by the production task consists in resolving a series of local problems (depending on the subject's task-based and linguistic competence, the process will be more or less problematic) in a satisfactory manner. As we postulated earlier, the generation of options is subject to one's linguistic competence. However, the criteria used by the writer to generate these options are subject to his/her task-based competence. To explain how these two are related, we refer to the work carried out by Rumelhart and PDP Group (1986). Following these authors, the internal features of a word

responsible for its content are connected to its external features responsible for its form. For example, we know that in comprehension the use of linguistic competence is passive and it is sufficient to recognise some of the external features of the word in order to obtain access to its internal features. In contrast, production requires active linguistic competence and it is necessary to know all the external features to produce the word. In production, an option's internal features have their origin in the production task and one's task-based competence progressively activates the memory nodes in the process of planning. Once some local objectives are defined and thus some internal features are activated, the individual makes use of his/her linguistic competence to access the external features of the words whose internal features appear activated. Once a whole set of internal and external features is brought into one's working memory, this can be considered a tentative linguistic option subject to being evaluated. This evaluation consists in checking the features of the option against language norms and the global task criteria. If the result is "a worse than average illusion" (Stevick 1996: 95), the writer identifies a problem, which has to be solved following some kind of strategy.

Text production is thus not limited to encoding. In fact, encoding or unproblematic production is only one part of the production process, difficult to investigate as it leaves no visible traces apart from its result. What does leave evidence behind is problem-solving. In their studies on the cognitive process of writing Flower et al. (1986:39) observe that detecting problems in a composition requires a process of evaluation, which consists of contrasting the text in terms of its progress and its goals. After detecting a problem the writer tries to define it ("diagnosing problems"). Problem representations are situated on the continuum from "simple detection", through "ill-defined problems" that already contain criteria related to the goal but no information about possible solution strategies, to the "well-defined problems" that already contain the solution rule (Flower et al. 1986: 40). According to the authors, the latter is only the case for spelling, grammar or usage problems.

Placing L2 writing within a problem-solving context allowed it to be studied by Cumming (1990), Swain and Lapkin (1995) and Roca de Larios et al. (2001), who attempted to define the

problems encountered by L2 writers and to describe the strategies used to solve them. Cumming (1990) studied problems in L2 writing in terms of the strategies students applied to solve them. Cumming's categories included: (1) searching out and assessing improved phrasing, (2) comparing cross-linguistic equivalents, (3) reasoning about linguistic choices. We could situate the problems that originated these strategies somewhere on the continuum between "ill-defined" and "well-defined" in Flower et al.'s terms. Swain and Lapkin (1995: 381) also studied problems in L2 text production and established seven categories of "language-related episodes according to how the learners solved [...] the linguistic difficulties that they identified as they produced the target language": (1) sounds right/doesn't sound right (lexical and grammatical), (2) makes more sense/doesn't make sense, (3) applied a grammatical rule, (4) lexical search (via L1, via L2 or via both) (5) translation (phrase or greater) (6) stylistic, (7) spelling. We can observe that some of these categories refer to problems that would be situated somewhere between "simply detected" and "ill-defined" in Flower et al.'s terms, namely: "doesn't sound right", "doesn't make sense" and "stylistic" already seem to contain criteria related to the goal but no information about possible solution strategies; while other strategies seem to refer to "well-defined" problems: this is the case of "applied a grammatical rule" and "spelling".

Roca de Larios et al. (2006) also studied retrieval and lexical search strategies in L2 writing, and came up with a binary classification of L2 formulation problems: "compensatory" ("derived from lack of (automatic) access to linguistic knowledge required to express the intended meaning") and "upgrading" ("resulting from an effort to upgrade the expression of meaning or to find a better match between intention and expression or both") (ibid: 106). The authors found that proficiency appeared to influence the type of problems that writers posed themselves: more proficient writers dedicated a larger amount of time to improving the expression of meaning or discovering a better match between intention and expression, or both, while less proficient subjects devoted their time mainly to compensating for the lack of linguistic resources.

Contrasting the abovementioned findings, it may be observed that one of the problems arising in L2 writing may originate in the fact that the writer is unable to retrieve an L2 option from

his/her memory, with a corresponding L1 (or L3) option being generated instead. Clearly, this option will not pass the language filter. A second problem may derive from the writer's impression that the L2 option retrieved from his/her memory is imperfect, in other words, does not pass one of the norm filters. The degree of problem definition in this case may vary: the writer may just feel that the tentative option "doesn't sound right", "doesn't make sense" or it is inadequate in some aspect, for example, style, and thus needs to be changed, or s/he may already know the strategy to apply to solve the problem ("spelling", "applied a grammatical rule"). It should be added that when the option is discarded, the generation process may begin again, which may later lead to a new problem type that consists in choosing between several "imperfect" options (Zimmermann 2000: 86, Pym 2003: 489).

It should be noted that none of the studies mentioned above consider the possibility of using external resources to solve L2 production problems. In the following sections we discuss a model attempting to bridge the gap between these studies and research on dictionary use.

4. Solving L2 production problems using external resources

Thus far we have described the production process based exclusively on internal resources as a global problem-solving process consisting principally of an encoding process complemented by local problem-solving processes. We have already concluded that a problem in L2 production is either a global problem related to the overall production task or a local problem resulting from an immediate lack of internal resources. When certain internal resources are lacking, strategies described in Cumming (1990) and Swain and Lapkin (1995) may help, but the resulting solution will still be limited to the existing internal resources. One of our earlier studies (Kozlova 2007) demonstrated that using external resources improved students' effectiveness in correcting mistakes previously marked by the teacher from 50% (corrected by the majority using only internal resources) to 90%. Such a breakthrough can only be explained by the fact that external resources provide additional information that compensates for shortcomings in the writer's existing internal resources.

The idea that a dictionary should not be used directly for encoding purposes and that its use is especially indicated in re-production tasks makes us recall that all text reproduction includes two parts: decoding and encoding (Rickheit and Strohner 1989). We have already argued that encoding is an activity based exclusively on internal resources. As Leki et al. (2008) observe, writers rely on internal resources to generate content. We also know that the production process and, in particular, formulation is not restricted to encoding. Encoding is just a part of the process and encoding sequences (bursts) are continuously interrupted by other activities: “writing, rehearsing, reading, repeating and, sometimes, pausing alternated when dealing with text transcription” (Leki et al. 2008: 133). This supports the idea of a cyclic process expressed by Flower and Hayes (1981) and developed further by Schilperoord (2001: 316) who observed that there is a constant shift between the focus on the content and the focus on form, with the two processes merging somewhere at the clause level.

We suggest that consulting resources, such as dictionaries, is a decoding activity that allows the writer to obtain additional information to compensate for its immediate lack in the memory (Figure 1).

When a problem arises, the perceived difficulty of the text related to greater demands on the quality of the product will make the writer engage in additional decoding to reduce the lag between his/her initial knowledge and the final knowledge required to fulfil the production task. This decoding may take place using whatever resources the writer has at hand including the very text “under construction”, other texts, dictionaries, or other external sources of reference such as those listed in Stapleton (2010: 304): concordancers, corpora, corpus consultations and Add-Ins. Decoding may occur at any stage of the production process: before, during and after encoding, often even interrupting it. However, due to the limited capacity of the human working memory, certain linearity in the production process is essential, and this means that one should continue making decisions about the outcome because, if most decisions are deferred, it would be impossible to cope with all the accumulated information at a later stage. This implies that the solutions adopted at certain intermediate points of this process need not be the best ones. From this point of view, even bad solutions help to advance the global process of the production task, given that these are left as local problems to be solved. In this sense, L1 lexical options, as well as L2 imperfect lexical options would be perfectly valid. Qi (1998) found that language-switching facilitated rather than inhibited L2 composing processes and Wong (1993) observed that leaving blanks during writing in order not to interrupt the thread of thought was a strategy characteristic of more skilled writers. Chenoweth and Hayes (2001: 96) advise L2 text producers to “write it down, even if flawed, and revise it later”, thus promoting the idea of L2 text production as a draft to be improved.

The process of improving L2 written drafts, also referred to as revision, may involve consulting external resources after the writer have identified his/her doubts or local problems to be solved. According to Eigler et al. (1990: 50-51), “a situation in itself is not a problem although it may become one when someone defines it as such”. We have discussed corrective feedback from a cognitive perspective elsewhere (Kozlova 2010). In revising one’s own draft, however, we assume there is no “more knowledgeable other” (Vygotsky 1978) to help the writer to identify

and scaffold a problem. It is true that many more resources are now available to help the writer identify and correct his/her mistakes but, as Stapleton (2012) reports, even among L2 graduates few go beyond spell- and grammar checkers and online translators when revising their drafts. Flower and Hayes (1981: 369) observe that “people only solve problems they define for themselves”. From this point of view, only the situation in which the writer him/herself is aware of certain task requirements and of the corresponding immediate lack of internal resources should be considered a problem (Presas 1997:591).

5. Study design

The objective of our study was to determine how subjects used external resources to solve problems in L2 text production and to what extent, while using external support they relied on internal resources to reach their final decisions. We also wanted to determine subjects’ knowledge of resources and attitudes to their use and to contrast these with their actual performance. A text production task was set and a customised questionnaire was designed based on our model of L2 text production as a problem-solving process using external resources (Figure 1). Our study was designed to answer the following research questions:

1. What do students do with the results of their search? What criteria do students use to evaluate them?
2. Is there any relation between student’s attitude to learning more about resources and their ability to benefit from them?

Results obtained from both individual subjects’ behaviour and common group characteristics will be used to design an appropriate training program for the use of external resources in L2 text production.

5.1. Methodology

The data analysed in our study are cross-sectional, presenting a “snapshot” (Flick 2007: 45) of L2 students’ use of external resources in text production at the beginning of their tertiary education. In contrast to other studies adopting a mainly normative approach to the study of

dictionary use (Ard 1982, Christianson 1997, Chon 2009), our intention was to focus on students' own approach to their use, thus discarding such variables as correctness or acceptability from the teacher's normative point of view. Instead, we operated with the concept of a doubt, or problem, and study variables such as knowledge of resources, their use in problem-solving and subjects' reported attitudes.

Data in our study was collected from two sources: on the one hand, subjects' actual performance while writing and revising their text; on the other, their responses to a customized questionnaire. Four types of data were obtained: 1) subjects' doubts after having written a draft of their text, 2) segments of the draft that corresponded to these doubts, 3) segments of their revised text that corresponded to these doubts, 4) subjects' responses to the questionnaire.

The first three types of data were compared to obtain action types that would account for the stages that presumably form part of the overall problem-solving process in text production, i.e. detecting/defining the existing information lag, finding the necessary information in different resources (both internal and external) and using this new information for encoding purposes. The action types were then compared to responses to the questionnaire. The results of this triangulation of data allow us to suggest possible relations between certain attitudes to resources and problem-solving strategies.

5.2. Study group

Our study was carried out with 42 first-year students (\pm 20 years of age) from the Faculty of Sociology and Political Science, Universitat Autònoma de Barcelona (UAB), who had enrolled in a compulsory course on English for Social Sciences in two successive academic years: 2009-2010 (14 subjects) and 2010-2011 (28 subjects). All subjects had studied English at school, although their language level at the beginning of the course ranged from A2 to B2.1 of the European Common Reference Framework for Languages, according to the results of the Computer Adaptive Test taken at the UAB campus-wide Language Service.

The linguistic situation in Catalonia is such that most subjects speak Spanish and Catalan interchangeably. For the purposes of our study, we refer to these languages as L1. To avoid unnecessary discussion about the status of English - the predominant language used in the international context within which these students will develop their professional careers - we refer to English hereafter as L2. As far as the use of external resources was concerned, subjects normally had a computer with Internet access available in their homes, in the university library, or in the university computer rooms. This ensured regular access to online resources both for academic and social purposes. Subjects also possessed, and were accustomed to using (as advised by their secondary and high school English teachers) printed dictionaries at home or in class. However, their use of external resources was assessed neither at the beginning nor at the end of their course. In fact, the use of dictionaries (printed or electronic) was prohibited in final exams.¹

5.3. Tasks

The experimental task began as a standard task for all first-year students in the Faculty on the first day of class in order to determine their L2 level of proficiency. Subjects were asked to write a composition – referred to hereafter as Draft – in which they had to explain their choice of Degree and the reasons behind their choice. The time allowed for this task was limited to 40 minutes, there was no word limit, and no external resources were available. Subjects were required to produce a hand-written text in a conventional lecture theatre.

The second part of the experimental task began when, after completing this task, subjects in the first cohort (14) and the second cohort (28) were asked to make a list of the doubts that had arisen during the text production process – a Doubt List – before handing in their compositions. After a short break, students were given access to online resources and different printed dictionaries and their task was to solve their doubts in the Doubt List and improve their compositions making use of these resources to obtain their Final Version.

¹ The teachers of the subject by majority decided not to allow the use of dictionaries or other resources in exams. This decision was taken because the exam included checking the knowledge of certain essential vocabulary learnt during the course.

After subjects had handed in the Final Versions of their compositions, they were required to fill in a questionnaire about the task and their habitual use of resources. The aim of this questionnaire was to provide data on subjects' knowledge of resources, problem-solving actions, attitude to resources, effectiveness in their use of resources, and teachers' attitude to their use, as perceived by students. We expected these subjective data to be comparable to the objective data coming from the students' composition and revision processes.

5.4. Data

Data was obtained from two sources: subjects' L2 text production (problem-solving actions), and their answers to the study questionnaire. Three kinds of comparable data were obtained from the subjects' texts:

- Doubt elements as they appeared in the Doubt List (DL)
- Doubt elements as they appeared in their Draft (DD)
- Doubt elements as they appeared in the Final Version (DF)

Data obtained from the study questionnaire revealed students' opinions concerning the use of external resources to resolve their Doubts, and was subsequently triangulated with the data obtained from the production task. It was thus possible to contrast the degree of subjects' satisfaction after using external resources with their actual completion of the problem-solving processes; the declared problem-solving strategies as opposed to the steps actually taken, etc.

The questionnaire administered was based on our model of L2 text production as problem-solving using external resources (Figure 1). It consisted of 10 closed and 4 open questions (published in Kozlova and Presas 2013) which provided information on subjects' knowledge of resources and the steps taken in the problem-solving process.

The comparison of data from the three sources mentioned above (Doubt List, Draft and Final Version) allowed us to codify subjects' performance according to the following action patterns (see Table 1 below):

- COR: the element from the Doubt List was corrected in the Final Version as opposed to the Draft;
- NOCOR: the element from the Doubt List appeared in the same form in the Final Version as in the Draft. This action was further split into the following sub-actions:
 - o CONF: the element from the Doubt List, after consultation, seemed to be confirmed by the student in its initial variant coming from internal support;
 - o SOL: the element from the Doubt List was assigned a new solution apparently coming from external support but was not corrected in the Final Version;
 - o NOSOL: the element from the Doubt List failed to be assigned a solution coming from external support.

-	Condition	Examples	Action	Sub-action
1	DD≠DF	DL= Politic parties or political parties?, DD= politic parties, DF= political parties	COR	-
2	DD= DF, DD is in L2 and DL includes DD and a sign of confirmation	DL= phenomenons -> V, DD = DF = phenomenons	NOCOR	CONF
3	DD= DF, DD is in L2 and DL includes DD, L1 equivalent and a verbal confirmation	DL = partners (socios) -> I have a doubt with that word and I check it. I wrote it right. DD = DF = partner	NOCOR	CONF
4	DD= DF, DD is in L2 and	DL = política -> politics, DD = DF	NOCOR	CONF

	DL includes DD and an L1 equivalent	= politics		
5	DD= DF, DD is in L1 and DL includes DD and an L2 equivalent	DL = batxillerat-> baccalaureate, DD = DF = batxillerat DL= útil->useful, DD = DF =“útil”	NOCOR	SOL
6	DD= DF, DD is in L2 or interlingua and DL includes L1 and L2 equivalents but does not include DD	DL = diplomacia-> diplomacy, DD = DF = diplomatics DL = materia (escuela)->subjects, DD=DF=“class”	NOCOR	SOL
7	DD= DF, DD is in L2 or interlingua and DL includes DD and its alternative version in L2	DL= In that moment-> at that time, DD = DF = in that moment DL=carrer’s->degree, D=DF=carrer’s	NOCOR	SOL
8	DD= DF, DD is in L2 or interlingua and DL includes DD and a sign of unresolved doubt	DL = "crecer como persona" grow up like a person"->?, DD = DF = grow up like a person DL =interesants=interesants?, DD = DF =interesants	NOCOR	NOSOL
9	DD= DF, DD is in interlingua and DL is in L1	DL = estar, DD = DF = are stay	NOCOR	NOSOL
10	DD= DF, both DL and DD are in L1	DL = disculpar-perdonar, DD = DF = "perdono"	NOCOR	NOSOL

Table 1. Action types with criteria and examples.

As we wished our codes to be essentially data-driven, certain data combinations were identified as specific to individual action patterns. Overall, we were able to identify at least three cases in

our database that fitted into the concept of each of the abovementioned sub-actions of NOCOR action, which together with COR action (which was not further split into sub-actions) gave us a total of 10 identifiable cases of data combinations.

As criteria to distinguish between data combinations we used the language (L1 or L2) of the option generated, express approval (either as a sign or as verbal approval) and signs of unresolved doubt. For example, two data combinations that made us think of the sub-action CONF were cases 2 and 3, one containing a sign of approval and another verbal approval of an L2 variant generated internally by the writer already at the Draft stage. One more type of CONF was identified when we compared case 4 and case 5. Although these cases appeared to be identical in the Doubt List, the fundamental difference lay in the language of the option generated in the Draft. When expressed in L2 the case was classified as NOCOR CONF, and when expressed in L1 - thus indicating the writer was unable to call up any L2 variant and an L1 variant was brought to mind instead - the case was classified as NOCOR SOL. In a similar type of the problem (case 10), which this time remained unresolved, the case was classified as NOCOR NOSOL. At times, it was difficult to classify subjects' options as examples of L1 or L2, e.g. "conscient", "social ambit" or "simpathics" (NOCOR NOSOL 9). These options, in fact, reflected their "interlingua" (Selinker 1972) or "approximative"/ "deviant linguistic system actually employed by the learner attempting to utilize the target language" (Nemser 1971). Looking at cases 6 and 9, we observe how the writer generated an "interlingua" option in the Draft but also generated an L1 option to include it in the Doubt List as an access key for a future bilingual dictionary consultation, successful in the former case and unsuccessful in the latter.

Occasionally, the Doubt element listed in the Doubt List did not appear in the Draft or the Final Version, which led us to adding the category Missing. Finally, signs of approval or unresolved doubt did not always appear in the Doubt List. Instead they appeared or were implicit in the Draft or Final Version, for which case the category Doubtful was established (Missing and Doubtful do not appear as action types in Table 1).

5.5. *Statistical analysis*

Descriptive statistics were used to summarize data obtained from the answers to each question in the questionnaire. Relative frequencies for each category were computed and represented graphically.

Bivariate analysis was carried out to analyse the relationship between answers to the questions in the questionnaire and subject's performance. Proportions were tested using a Chi-Square Test for homogeneity if application conditions were satisfied; alternatively a Fisher's Exact Test or LR Test was used. The confidence level was set to 0.95.

6. Results

We present the results of our data analysis in the same order as we posed our research questions.

In relation to our first research question, "What do students do with the results of their search?" we observed that 37.14% of the doubts that appeared in subjects' Doubt Lists were corrected in the Final Version as opposed to the Draft (COR). Another 17.62% were not corrected in the Final Version but were solved in the Doubt List (NOCOR SOL), and 16.19% were not corrected because they were confirmed by the students in their initial variant earlier produced in the Draft with internal support (NOCOR CONF). Only 12.86% of doubts appear unsolved (NOCOR NOSOL). We were unable to classify 11.90% of doubts (DOUBTFUL) and 4.29% of Doubts did not appear in the Draft or the Final Version although they were listed in the Doubt List (MISSING).

In relation to the second part of our first research question "What criteria do students use to evaluate them [the results of their search]?" we used the data obtained from responses to Q6 which shed further light on what subjects did with the results of their consultation.

Q6: What comes after consulting resources?

The majority of subjects (56.10%) referred to revising or editing, thereby demonstrating their awareness of solving the global problem of the task. The contrary strategy, correcting at a local

level, was apparently used when subjects referred to correcting mistakes (21.95%). A third group of subjects (21.95%) referred to confirming solutions.

To see how students' evaluation criteria correlated with their problem-solving actions we decided to carry out the cross-category bivariate analysis of data from Q6 and actions. However, while data from Q6 was obtained per subject, data on subjects' performance was per action, as each subject usually carried out more than one action type. We therefore classified each subject according to his/her predominant action type (Table 2).

Action	Number of participants	Participants %
COR	21	50.00
NOCOR SOL	8	19.05
NOCOR NOSOL	5	11.90
NOCOR CONF	5	11.90
DOUBTFUL	3	7.14
Total	42	100

Table 2. Predominant actions per individual (N=42).

The cross-category bivariate analysis of Q6 and subjects' action types (Figure 2 below) produced statistically significant results ($p = 0.0431$) and revealed that those subjects with a predominance of COR actions in 75% of cases declared their objective was to "revise" or "edit", that is, they referred to a global problem (L2 production task in Figure 1) to be solved. They rarely mentioned "confirm" (5%). The subjects with a predominance of NOCOR actions presented different characteristics. In particular, those subjects who carried out mostly NOCOR CONF actions in 60% of cases declared their objective was to "correct". Those subjects who mostly carried out the action of NOCOR SOL (apparently solved problems but introduced no

corrections in their Final Versions) are characterized by making little reference (8%) to “correcting” at the local level.

Figure 2. Cross-category analysis of Q6 responses and predominant action types.

In relation to our second research question, in order to determine whether students’ attitude to learning about resources was related to their ability to solve their problems using external resources, we conducted bivariate analyses of data from each of the two related questions, Q11 and Q12, with subjects’ problem-solving actions.

Q11: Do you think you need to know them [your favourite resources] better?

Q12: Do you think you need to know other resources?

Although the correlation was not statistically significant ($p = 0.1341$) in the analysis of Q11 and actions, Figure 3 shows that the desire to learn more about already familiar resources was expressed more frequently by subjects who were able to solve their doubts (86% of those whose predominant action type was COR; 63% of those whose predominant action type was NOCOR SOL; and 60% of those whose predominant action type was NOCOR CONF). It was expressed

less frequently by those who were unable to solve their doubts (40% of those whose predominant action type was NOCOR NOSOL).

Figure 3. Cross-category analysis of predominant action types and Q11.

A similar tendency was observed in a bivariate analysis of data from Q12 and actions. Although the correlation established was not statistically significant ($p = 0.501$), we found that the desire to learn more about new resources was expressed more frequently by those subjects who were able to solve their doubts (70% of those whose predominant action type was COR; 63% of those whose predominant action type was NOCOR SOL; 60% of those whose predominant action type was NOCOR CONF). It was expressed less frequently by those who were unable to solve their doubts (40% of those whose predominant action type was NOCOR NOSOL).

7. Discussion and conclusions

There is a current need to teach dictionary use for L2 text production purposes: students are generally willing to use external resources as they think it helps them to solve some of their doubts. However, only skilful dictionary use improves students' writing performance, which

calls for placing both in the recently suggested cognitive perspective. Some research in which the writing process is studied from a cognitive perspective does exist, but the use of resources in writing has just started to be contemplated as part of it.

We postulate that writers use external resources in text production to solve encoding problems when internal support is not sufficient. A problem arises when the writer detects a lag between perceived task requirements and existing internal resources. The problem can be resolved after having updated the internal resources through dictionary or some other external resource consultation.

The study we present parallels our cognitive model of L2 text production: problem-solving using external resources (Figure 1). Our subjects produced a text using internal resources and detected a number of doubts in their writing they were unable to resolve using internal support only, which guaranteed the relevance of future consultations when they were finally given a chance to improve their composition using external resources. In their answers to the questionnaire, almost all of them demonstrated awareness of the need to rely on their internal support while writing. However, most of the subjects (78.95%) stated their wish to have access to resources not only during revision but throughout text production (see Kozlova and Presas 2013), thus supporting the cyclic nature of the production process and contradicting teachers' recommendations to withhold consulting resources till the end of the production process.

We found that only 12.86% of all the Doubts fell into the action type category of NOCOR NOSOL, which leads us to conclude that the remainder of the Doubts could be characterised as solved by our subjects. Some of these Doubts were corrected in the Final Version as opposed to the Draft, which leads us to believe that they were solved first and corrected later (COR). Others appeared as solved in the Doubt List (an L2 equivalent or L2 alternative version was provided) but no correction of these solutions was introduced in the Final Version (NOCOR SOL). Still others appeared in the Doubt List with a sign or comment of approval of the same L2 solution that have been introduced in the Draft, which led us to conclude that subjects did not change

their opinion about their solution after having consulted external resources (CONF). It is difficult to affirm that consultation took place in each case, although our evidence (based on cross-language equivalents, signs and comments of approval, and L2 alternative versions) speaks for the generalized use of resources during the revision task. Our classification of subjects' problem-solving actions showed the importance of the concept of "interlingua": generating an option internally often leads to neither L1 nor L2 options, but instead an "interlingua" option (see more on generating "interlingua" options in Kozlova and Presas 2014). Subjects then proceeded either to use this option as an access key to consult external resources or to additionally generate an L1 option as an access key. Moreover, subjects at times regarded their L2 option as "interlingua" and dealt with it as if it were a problem to be solved in the abovementioned manner, finally accepting the same solution as the one generated by their internal resources. It should be noted that, of all our cases, only cases NOCOR SOL 5 and NOCOR NOSOL 10 clearly refer to "compensatory" problems as defined by Roca de Larios et al. (2006), while only cases NOCOR SOL 7 and NOCOR NOSOL 8 refer to what these authors call "upgrading" problems. The fact that we identified cases NOCOR SOL 6 and NOCOR NOSOL 9 involving "interlingua" use, apart from CONF cases with both L1 and L2 elements as access keys, suggests that the study of L2 text production involving the use of external resources requires a specific approach. In particular, the variety of cases observed in our classification suggests that it should not be taken for granted that the option generated by the internal support in the draft is necessarily the one to be used as an access key to solve the problem via external resources.

Unfortunately, research conducted up to now has not yet analysed students' "problem-space" (Manchón and Roca de Larios 2007) with external resources in mind. This would appear to be a promising area of research in the future and would require the use of advanced data collection tools. Subjects' verbalization of their problems should at least be contrasted with eye-tracking evidence while consulting resources. The comparison of the two "snapshots" of the "problem-

space”, before and after consulting resources, may well enable researchers to explain how problems were solved and why certain corrections were introduced.

Within the framework of the present study we have not yet been able to answer the questions of “how” and “why” but we were able to track whether the subject’s problem was solved and whether corrections were introduced as a consequence. This information, contrasted with the questionnaire data, allowed us to determine certain patterns in our students’ behaviour. We observed that having found a solution to a problem did not always lead to the introduction of corrections and this was not only due to the fact that subjects did not change their mind after having consulted resources. Curiously enough, certain subjects just systematically forgot to introduce corrections in the Final Version although they had found a new solution (apparently, from external resources). These students seemed to have as their priority global language acquisition objectives and, in L2 writing, paid little attention to the lexical level and, consequently, to the final quality of the text produced. Others, on the contrary, focused on the lexical level and mostly confirmed their decisions. The majority of our subjects, however, were characterised by introducing corrections after having had a chance to consult resources focusing on global task and text objectives as their priority.

However, our data suggests that there were some subjects who were unable to solve their problems and who often showed reluctance to learn more about already familiar resources and new resources. Although we have not found statistically significant relation between the ability to use resources and the desire to learn more about them, it looks like there are some subjects who are not skilful in using resources and at the same time lack motivation to use them, while others are both more skilful and demonstrate more motivation. Specific training in reference skills would be beneficial to both types of students.

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