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Reading–writing connections: Discourse-oriented research

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Abstract. As reading and writing are both language processes, one can assume relationships between them, but the exact nature of these relationships has not yet been determined. While a large body of research has addressed reading comprehension and written production independently, very little investigation has examined the possible relationships between these two psycholinguistic processes, particularly from a discourse and cognitive perspective. Argumentative texts were analyzed in the present investigation on reading–writing connections. Four tests were designed and tested on 439 eighth graders. The tests assessed psycholinguistic variables that account for the microstructural, macrostructural and superstructural levels of comprehension/production processing. Correlation results showed significant coefficients between reading and writing of argumentative texts in all the psycholinguistic levels analyzed. These results suggest that the processes involved in both activities share some common knowledge-based strategies.

Key words: Reading–writing relations, Argumentation, Written discourse, Psycholinguistic processes

Introduction

The concern for the study of reading and writing has boomed in the last 10 or 15 years. Now that the revolution has come full cycle in cognitive sciences and discourse processing, no one doubts that adults must develop reflective and critical thinking that enables them to interact in an environment with increasing communicative demands. It is no news, however, that the discourse comprehension and production levels students show are below expected standards. Extensive research accounts for their underachievement, but many questions are yet to be answered, despite efforts made by researchers in the field (Brem, Russell, & Weems, 2001; Felton & Kuhn, 2001; Graesser, Gernsbacher, & Goldman, 1997; Graesser, Swamer, Baggett, & Sell, 1996; Parodi, 2002, 2003, 2005a, b; Peronard, Gómez, Parodi, & Núñez, 1998).

A quick review of the literature reveals researchers have only recently examined the relationships between processes involved in the comprehension and production of written texts. The high-level cognitive processes have been treated by various disciplines and interdisciplines as two

separate, independent fields of study. Therefore, a new research area is emerging that systematically investigates comprehension and writing from the same discourse and cognitive perspective aiming at shedding light on their connections (Boscolo & Cisotto, 1999; Eisterhold, 1991; Parodi 1998, 2003; Sadoski & Paivio, 1994, 2001; Spivey, 1997; Van Dijk, 1985; Van Dijk & Kintsch, 1983).

The purpose of the present study is to explore the text reading–writing relations from a discourse and cognitive perspective adopting a naturalistic approach (Graesser, Magliano, & Haberlandt, 1994a; Kent, 1999; Parodi, 2003; Van Oostendorp & Zwaan, 1994; Weisser & Dobrin, 2001). Research on these relationships should eventually move beyond correlational studies (Parodi, 2003; Tierney & Shanahan, 1991), yet there is still a lack of investigation that compares measures from a text linguistics perspective. While our study is correlational, it nevertheless examines text variables. Moreover, our focus on argumentative text moves beyond the prevailing emphasis on narrative discourse.

The present study has three objectives. They are (1) to advance the study of connections by documenting a table of indexes from a psycholinguistic perspective; (2) to obtain contrastive data on performance measures for argumentative discourse comprehension and production; and (3) to determine correlations between reading and writing processes at different text levels (local versus global coherence and superstructural organization). We assume there are similarities between reading and writing, but we want to compare them systematically and analytically. Two main conclusions emerge. First, significant correlations are found between reading and writing. Second, the strongest links are detected at the level of local cohesion and the microstructural level. Since, reading and writing argumentative texts are some of the most difficult tasks students face in academic life, we assume participants have problems in comprehending and producing this written organizational superstructure (thesis, arguments, and conclusion).

In order to achieve these objectives, we designed four tests: two comprehension tests and two writing tasks, as will be described later. The tests were administered to a group of 439 eighth graders attending subsidized schools in Valparaíso, Chile.

Theoretical scope

Connections between textual comprehension and textual production

The literature on reading–writing connections is scant, particularly among the publications available before the late 70s. Irwin (1992) and

Tierney (1992) agree that the first published work on this line dates back to 1929 and that the 80s and the 90s were the decades when the reader/writer relation and cognitive processes were of major concern. According to these authors, no attempt at linking comprehension and written production was made before the 90s. Reading was essentially conceived as a receptive skill, while writing was a productive one, so they were taught independently. Stotsky (1983) presented a variety of correlational studies of comprehension and production, paying special attention to those carried out between 1965 and 1977. Most of these efforts correlate comprehension achievements with writing ability, and most of them reveal highly significant correlations. Subsequently, Shanahan (1984) and then Shanahan and Lomax (1986) detected positive correlations among various factors, which associated comprehension and production.

Tierney and Shanahan (1991) reviewed the state of research on reading–writing connections, including many aspects that had been neglected up to that time. The outcomes of several investigations were documented and critically examined, including educational implications. Their efforts to account for progress on the subject, from their perspective, reveal the limitations affecting the development both of theories and research to date. According to Irwin (1992), 83% of the research in this area until 1984 was classified as educational and were mainly experimental. Most efforts focused on instructional models with no incorporation of basic theoretical models (Eckhoff, 1983; Harp & Brewer, 1991; Hass, 1989; Heller, 1995; Sager, 1989). A very limited number of these studies included textual variables, most of them concentrating only on narrative texts.

From our perspective, most of these investigations have a number of problems. As a result of influential theories at particular historical moments, the underlying models in many cases were under strong structuralist influence that limited them to word and sentence units. Consequently, the instruments used to assess comprehension did not tap comprehension of a text, but instead typically tapped literal reproduction of the information (shallow level questions) or/and fluent reading aloud and recognition of particular syntax patterns (cloze test). The tests that measured production focused mainly on formal aspects rather than on substantive referential content; that is, the tests paid particular attention to spelling, use of assorted vocabulary items and diversity of syntax structures. They did not take into consideration other aspects, such as the implied audiences, the writer's role, the subject matters, and rhetorical composition (Ede & Lundford, 1988; Kucer, 2001; Langer, 2002; Spivey, 1997).

Investigations on reading–writing connections have not been guided by a consensual framework or unified theory of language processing. Therefore, the standards used to correlate reading and writing were not necessarily comparable and did not share a common ground of similarity. It is important to point out that the concepts of discourse, comprehension, and production have evolved dramatically during the last few years. Modern concepts of written discourse assign a central role to mental processes and the role of the reader/writer's previous knowledge (de Beaugrande, 1997; Gómez, 1994; Nystrand, 1987; Van Dijk, 1985). The main obstacles are: (a) problems with the theoretical definitions or theories underlying reading and writing, and (b) problems with the measures that are being compared when they do not focus on the same psycholinguistic construct.

This new emerging line of research maintains that reading and writing are related processes, and that there are insightful frameworks that relate the two activities. Examples of these are the investigations conducted by Spivey (1990, 1997) and by Sadoski and Paivio (1994, 2001). Spivey (1990) argues that if a written text is produced from particular sources, then the reader becomes a writer because the source text is transformed into a new text. That is to say, the writer, while using other texts in the creation of a new one, employs constructive operations of organization, selection, and connection to elaborate meaning. Spivey (1997) explored a discourse approach from the point of view of discourse analysis, semiotics, post-structuralism, and deconstructivism. Sadoski and Paivio (1994) were initially concerned with reading and were in search for a unified theory of literacy, so they proposed a dual coding theory for reading and writing. Sadoski and Paivio (2001) developed a systematic theoretical approach that covered the processes of comprehension and production and their different components, stressing the importance of integrating verbal and non-verbal cognition. Sadoski and Paivio justified (step-by-step) the central and integrated role of linguistics and mental imagery by articulating a unified theory for reading and writing with non-linguistic knowledge and imagery components (*Dual Coding Theory*).

Models of the reading–writing connection

As discussed earlier, there are few doubts today whether discourse comprehension and production are related (Belanger, 1987; Eisterhold, 1991; Irwin & Doyle, 1992; Kucer, 1985, 2001; Langer, 1986, 2002; Parodi, 2003; Reuter, 1995; Sadoski & Paivio, 1994, 2001; Spivey, 1997). However, there is a central focus on the status of possible connections.

Eisterhold (1991) postulates three interrelated hypotheses, which independently account for discourse connections. According to Eisterhold, these hypotheses reflect the direction of transfer from one discourse mode to the other. The differences between the models address the way cognitive processes and linguistic mechanisms are related to transfer between comprehension and production.

The bidirectional hypothesis starts from the assumption that reading and writing might be interactive in some levels, but independent in others. This model presents the relations between comprehension and production as a constellation of interrelated processes that use a substratum of common knowledge, without overloading the individual's cognitive system. What a person learns at one developmental stage of one domain may be qualitatively different from what he/she learns at another. So it is important to accept the existence of multiple relations between both domains, as well as the possibility that ontogenetic changes occur. Eisterhold (1991) contends that the bidirectional model is the most complex, but also the most complete. Moreover, Eisterhold postulates separate subsystems as well as particular underlying strategies that are common to both domains.

The bidirectional hypothesis is compatible with Van Dijk and Kintsch's (1983) idea that the reading–writing connections would save resources for the reader/writer's cognitive system. In essence, the possibility of having common basic strategies would allow a more economical distribution of the resources in discourse processing. Fitzgerald and Shanahan (2000) proposed a developmental model in which reading and writing are related differently as they change with growth. Figure 1 illustrates the ways in which the various components interact.

Substantial reflections on reading–writing connection were carried out in the sociohistorical constructivist paradigm (Greene & Ackerman, 1995; Irwin & Doyle, 1992; Kucer, 2001; Nystrand, 1990; Sadoski & Paivio, 2001; Spivey, 1997). The socioconstructivist assumption indirectly supports the relation proposed here that integrates reading and writing processes in a bidirectional model. They share a basic cognitive substratum, whose effective domain would have an impact on a qualitative improvement on the subjects' thinking processes.

Toward a discourse model of comprehension/production

The present study adopts a comprehensive theory proposed by Van Dijk and Kintsch (1983) to guide data collection analyses and to compare reading and writing processes from a bidirectional perspective. The

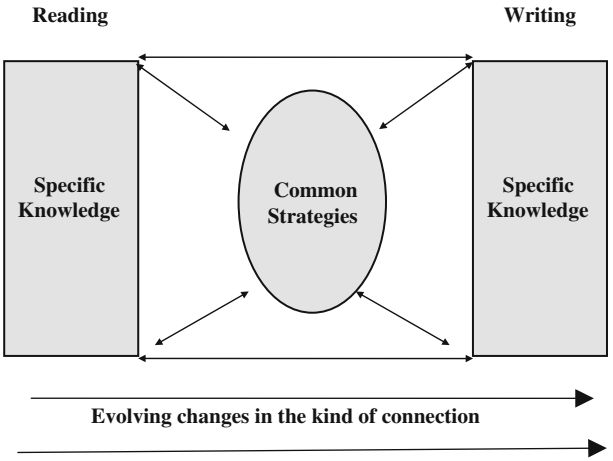

Figure 1. Diagram of a bidirectional model.

perspective is compatible with the author's latest studies (Parodi, 1998, 2003) as well as various other recent contributions (Boscolo & Cisotto, 1999; Kucer, 2001; Nelson & Calfee, 1998; Reuter, 1995).

In Van Dijk and Kintsch (1983) the processes start as strategic ones, based on situational models. Van Dijk (1985, 1990, 1999, 2002) argues that an interdisiciplinary approach is needed to establish an explicit relation between discourse, cognition and social situations. Such a model should contain information about:

(1) A cognitive theory of strategic processing of information which assumes the strategic nature of comprehension and discourse production are flexible processes, having multiple levels functioning in tandem with one another.
(2) A sociocognitive theory of discourse, which extends the strategic model of processing, including the role of beliefs and attitudes in discourse processing.

Listing its basic components will suffice here:

(1) Model of context
(2) Control system
(3) Semantic comprehension/production
(4) Macrocomprehension/production
(5) Microcomprehension/production

A detailed explanation of each of these components as well as the strategic levels can be found in Van Dijk and Kintsch (1983) and Van Dijk

(1980, 1985, 1990), complemented by Kintsch (1998), one of his most recent contributions.

Methods

The main focus of this research was to assess correlations between discourse comprehension and production. We computed correlations between comprehension and production of the students' achievements both globally (general mean scores at all linguistic levels) and partially (considering each level separately, including microstructural, macrostructural, and superstructural levels). To achieve the main objective, two discourse production tests and two discourse comprehension tests were designed. The written tasks of the writing tests (see Appendix 1) required the subjects to write an argumentative text based on some instructions that explicitly described the purpose of writing, the objective of the task or text type, the subject matter topic, the audience implied, and the supposed register (Camps, 1995; Camps & Millian, 2000; Coirier, Gaonac'h, & Passerault, 1996; Cooper & Odell, 1977, 1998; Ede & Lundford, 1988; Ruth & Murphy, 1988).

The comprehension tests (see Appendix 2) required students to read argumentative texts and answer nine open questions. The questions forced the readers to make some specific text-based inferences that were related to appropriate world knowledge and particular subprocesses under study (Graesser & Bower, 1992; Myers, Brown, & McGonigle, 1986; Parodi, 1989, 1990; Rickheit & Strohner, 1985). Both writing and reading tests focused on topics that had been previously discussed with the teachers of each class. Additionally, the students were given an interest test to select the topics they would like to read and write about (Vergara, 1999).

In an effort to avoid interference of any kind between the collection of samples for reading and writing, we organized all the sessions with substantial intervals between the four tests. One week intervened between reading tests and 10 days between the last administration of the reading test and the first writing test. The tests were administered by Spanish language teachers on different days of different weeks, and the tasks were considered as part of their daily school activities. The purpose of this methodology was to produce the minumun amount of interference with the normal school processes of constructing meaning through written discourse. The writing and reading processes were cognitively situated, public (Kent, 1999; Olson, 1999), and ecologically valid (Weisser & Dobrin, 2001).

Table 1 presents the kinds of questions included in the comprehension tests and the parameters evaluated on the written productions obtained. As is evident, one of the most important criteria was to assess similar factors in each process to ensure that the information being analyzed and compared was similar on psycholinguistic grounds and amenable to statistical comparison.

Table 1 tests are, in our opinion, one of the significant contributions of this study to the field of psycholinguistics. Since we have not found in the literature specific data to help us elaborate and evaluate reading and writing tests based on a clear text linguistics basis, we had to create guidelines that could be easily compared (see Appendix 3). An effort has been made to connect theory (Van Dijk & Kintsch, 1983; Van Dijk, 1980, 1985; Kintsch, 1998) to inferred empirical patterns that can be usefully compared on the same ground. As can be easily deduced from Table 1, the main distinction in three discourse levels (micro coherence, macro coherence, and superstructural organization) is taken from our theoretical framework: Van Dijk (1980, 1985, 1990) and Van Dijk and Kintsch (1983).

In each of these processing textual levels, subdivisions have been made in order to obtain a display of subprocesses that may account for some of the most important variables involved. In comprehension tests, inferential questions were elaborated based on information in the text; for example,

Table 1. Guideline for evaluating reading and writing argumentative discourse.

Level	Comprehension	Production
Microstructure (local coherence relations)	(a) Inferred nominal correference	(a) Maintained nominal correference
	(b) Inferred nominal ellipsis	(b) Maintained nominal ellipsis
	(c) Inferred cause–effect relations	(c) Maintained cause–effect relations
Macrostructure (global coherence relations)	(a) Inferred main topic	(a) Main topic development
	(b) Inferred macroproposition 1	(b) Macroproposition 1 organization
	(c) Inferred macroproposition 2	(c) Macroproposition 2 organization
Superstructure (text type canonical relations)	(a) Inferred thesis	(a) Explicit adequate thesis
	(b) Inferred arguments	(b) Adequate and coherent arguments
	(c) Inferred conclusion	(c) Adequate and coherent conclusion

referential items were selected because they are known to provide crucial inferences required to comprehend a text (Gernsbacher, 1990; Graesser et al., 1994a; Peronard et al., 1998). In reading comprehension, a noun and a pronoun need to be linked together through an inference process in order to build local coherence (e.g., ''Peter'' and ''he''); this was called *Inferred nominal co-reference*. In relation to the writing tests, in Spanish written discourse structure, a subject form is not repeated after an initial clarification because the verb shows agreement in person and number; so an elliptical noun or pronoun is required (e.g., The man is here. *Needs* help). This was called *Maintained nominal ellipsis*.

When we constructed the tests, we considered evidence showing that most Chilean eighth graders tend to produce two main arguments when writing argumentative texts (Parodi, 2000; Parodi & Núñez, 1998, 1999). Similarly, there was evidence that most texts selected by teachers for sixth and eighth graders had two macropropositions. These data were used when deciding what to include in the guideline (see Appendix 3) for designing and evaluating argumentative written discourse (Parodi, 1992, 1998, 2003, 2005a, b).

The selected sample of 439 students of both sexes was taken from 10 eighth grade courses of subsidized schools in Valparaíso, Chile. These schools are partly private and partly state funded and, in socio-economic terms, their students can be considered low middle class. Systematic compulsory education in Chile comprises 12 years: eight primary grades and four secondary grades. The child must be 7 years old at the beginning of the first grade, so our group students were approximately 13 years of age.

Analysis and interpretation of the results

Both the design and production of valid and reliable instruments to assess discourse comprehension and production must go through a number of major stages at evaluation to ascertain its validity (Crombach, 1988; Hedges, 1988). We adopted a triangulation method as a way to achieve these goals. Four experts judged the items based on the assessment guidelines, thus avoiding the distortion that a single evaluator might have caused. The experts read the tests and gave answers on a special sheet, with Likert scales, with different topics on each part of the tests. As a result of those analyses, a composite average (content validity and interraters reliability of) over 80% was reached. When the information obtained from the application of all the tests was processed, the statistical data analysis revealed that the difficulty of the comprehension test was

59.9%, whereas the difficulty of the production test was 60.3%. These are very good psychometric results for item difficulty. As far as the discrimination of the instrument is concerned, the comprehension test yielded 100%, and the production test 89%. The power of separation or internal differences between extreme scores was excellent in comprehension and optimal in production. The greater the difference between extreme scores, the better dispersion indexes in psychometric model adjusted to conventional formal instruction in Spanish.

Finally, the reliability coefficient of the comprehension test was 0.89 whereas the production test was 0.82, measured by an estimation of the KR20 (KR21) formula (Hair, Anderson, Tatham, & Black, 1999). These data support the claim that the tests were well designed and consistently measured what they were supposed to cover throughly. Results were valid and reliable according to psychometric criteria.

Results and discussion

Performance results

As a way to visualize performance per skill, Figure 2 shows some of the results from the general achievement at three discourse levels.

These percentages are remarkable in that they show internal congruence and comparative homogeneity. In observing these figures from a horizontal perspective, that is, per skill, the first thing that draws our attention is a progressive drop in achievement as the textual structure becomes more abstract, both in comprehension and production. In other words, the subjects have higher comprehension/production skills at local coherence level as opposed to macrostrategic skills. In this light, the demands required by the argumentative structure stand out as the weakest level in these subjects, and greater difficulties can be seen in the command of discourse categories involved in the comprehension/production of the argumentative texts. According to these data, our hypothesis is confirmed: local coherence gets the highest scores and the organization structure of argumentation is one of the major difficulties for students, both in reading and writing. An explanation for this behavior can be found in that students this age are better at short-term memory challenges and their inferential processes work much better at relating information close together than information separated by several paragraphs or information that must be reduced and thoroughly processed in the light of a global idea. On the other hand, narrative discourse is still being overused in the school system, so students are not well trained in spoken or

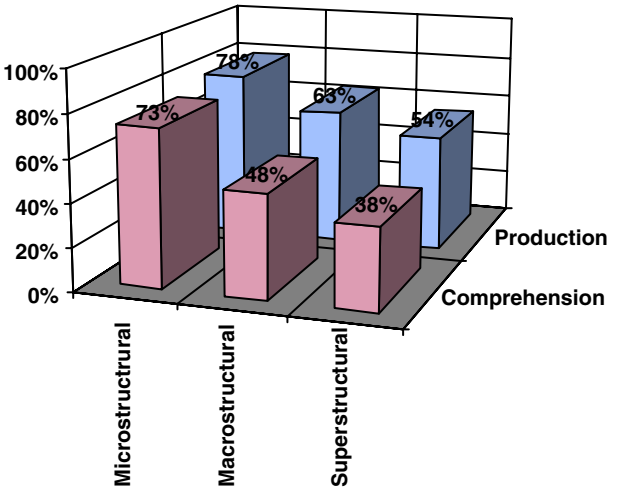

Figure 2. Achievement according to structural level (Figures have been normalized to 100).

written argumentation, not only in Chile but in many other countries (Brem et al., 2001; Felton & Kuhn, 2001; Golder & Coirier, 1994; Parodi, 2003, 2005b; Peronard et al., 1998; Sánchez & Álvarez, 1999).

The comparative analysis of the percentages between the two skills shows an interesting progressive drop, which in turn, reveals great cross-sectional homogeneity between discourse comprehension and production. This illustrates the potential relations between the two higher cognitive processes being compared. A progressive relation of difficulty in each area of the analyzed discourse structure can be detected, and this gives evidence of a similar difference between each structural level, both in comprehension and production.

Based on a non-systematic qualitative analysis of the data collected, that is, on some random answers obtained from the comprehension and production tests, it is possible to suggest that the strategies most widely used by the students lead them to the production/comprehension of the written text as a list of ideas, with no organization or hierarchy. This can be seen in the apparent difficulty students had in inferring transparagraphic relations, that is, macrostructural links, which contribute to establishing the coherence of the in-progress text (writing) or of the text already produced (reading). It is also evident in the difficulty to work following an argumentative superstructural (schematic) plan, which should guide the writing or reading activities.

An explanation of this behavior, according to the theory guiding this study, is that students do not keep information in their short-term

memory active, therefore, as they write, they forget the recently generated ideas and jump from one idea to the next. Normally, these non-expert writers have not been able to automatize the more superficial procedures, such as punctuation or insertion of connectors or accents, which leads to excessive concentration on those aspects, and less attention paid to the generation, organization and revision of their written ideas. Conversely, expert writers seem to maintain written and unwritten information longer in their short-term memory during the writing process.

From a discourse comprehension perspective, the same comparison can be established among the answers given by different comprehenders. Poor readers do not retain the incoming information in their short-term memory. Given their limited memory capacity and their inability to construct a reduced, coherent interpretation (macrostrategies), they forget the previous information to let the new information come in. Just like poor writers, poor readers focus their attention on very particular ideas and characterize them as macropropositions, without recognizing the superstructural categories of the texts. In turn, good readers, because of their better strategies and memory capacity, do construct a coherent interpretation of the information coming into their memory and can organize and reduce the information. Therefore, they can construct a situational model that helps interpret the text globally.

Correlational statistics

Results between discourse comprehension and production showed an overall positive correlation (0.72). That is to say, there was 51.8% of intersection (commonality) between both variables. The detailed analyses of these figures led to determining that the relations between comprehension and production on the microstructural (0.57), macrostructural (0.68), and superstructural (0.79) levels were highly positive and significantly different from zero. All of this indicates that, in considering the final numbers, 51.8% commonality reveals a quite extensive intersecting area between comprehension and production from the cognitive/textual perspective, as far as written argumentative discourse is concerned.

In facing these results, a number of questions arise. First, what correlates these tests substantially? And, what is the underlying common factor?

One answer can be found in the bidirectional theory. Given the positive and significant correlations on all levels of comprehension/production, there must be a set of strategies in common, that is, procedural knowledge constituting the support of the textual comprehension and production mechanisms. Or, in the sense of Reuter (1995), there must be a general

macrocompetence sustaining writing and reading, though such knowledge may vary throughout the subjects' development. In other words, the present findings suggest both a basic general common competence and the possibility of having mode-specific, diversified discourse competences. This reveals the possibility of exploring a more eclectic theoretical perspective of the mind such as the one proposed by Karmiloff-Smith (1992) in her representational redescription theory (RR). She suggests an approach in which a Piagetian constructivism and a general-based domain emphasis is combined with nativism and a Fodorian modularist view. In this new approach, Karmiloff-Smith proposes that the human cognitive development does not operate through stages but states, in opposition to classical Piaget perspective. The RR model focuses on ontogenetic progressive modularization process; this means that the child starts with general knowledge that progressively gets specialized in relatively independent modules. It could be that, therefore, reading and writing skills evolve from a general domain approach and move progressively towards a more modularist perspective as the human being develops. Of course, all this would favor a hybrid model of reading and writing in search for a general cognitive paradigm (Karmiloff-Smith, 1992; Kintsch, 1998) with a combination of symbolic and connectionist representations. Hybrid models such as this seem to be very useful nowadays, but face a lot of problems not clearly and properly addressed because the combination of these two kinds of cognitive representations (*propositions and connectionist neural nodes*) are not utterly unveiled (Parodi, 2002, 2003). This issue goes beyond the scope of this article, but it is nevertheless a major concern in the frameworks related to this line of research.

It is important to emphasize the difficulty in determining common strategies. Spivey (1997) and Sadoski and Paivio (2001) presented data on some common strategies, but they are so general that we believe their usefulness is very restricted and do not seem to help much in defining the possible psycholinguistic links. Also, Kucer (1985, 2001) has contributed some other common strategies for reading and writing (e.g., previous knowledge activation, discourse genre organization); again, the generality of the propositions imply that determining more specific common strategies might be a difficult task, based on the present available methods.

Another answer to the aforementioned questions could be found in the three levels of cognitive representation (*surface code, textbase, and situation model*) proposed by Van Dijk and Kintsch (1983) and Kintsch (1988, 1998). We agree with Graesser, Singer, and Trabasso (1994b) in that these are non-controversial components widely accepted by researchers in discourse processing. The data collected here helps us propose that students tend to process deeper reading–writing connections when constructing

situational models, but it is possible students use less similar strategies in constructing surface code (i.e., the exact wording and syntax) and textbase (explicit text propositions plus inferences needed for text cohesion and coherence). The situation-model construction skills, which are at a more complex representation level, require an integration of information from different sources and an active elaboration of previous knowledge in episodic memory, one the students this age seems to lack of.

This line of explanation, based on the cognitive levels of representation, could be very useful and productive. Unfortunately, most research is focused on reading comprehension (Madden & Zwaan, 2003; Zwaan & Radvansky, 1998), but not much investigation has concentrated in the importance of situation models for writing skills. Again, as mentioned in the introduction, reading and writing seem to be moving along different roads.

The central argument, therefore, is that connections show the highest positive and significant correlation on processes that start as strategic ones, based mainly on situational models, and not closer to the surface codification. Van Dijk and Kintsch (1983) and Van Dijk (1985, 1990, 1999, 2002) would argue that an approach that establishes explicit relation between discourse, cognition and social situations should be better. So, having a high reading–writing connection correlation at argumentative superstructure, based on comparable tests and scores, is a step beyond the past research that had focused mainly on sentence structure and on narrative texts. Of course, the nature of the specific and more global strategies remains unknown or at a general cognitive level.

Finally, the educational implications of this data for classroom activities suggest that language teachers should exploit the potentiality of teaching and practicing reading and writing together, starting from local cohesion resources to different text organizations. One of the key concepts should be to begin with the text and not with the words or phrases: the semantic unit must be perceived as a whole from the beginning. It may also be suggested to focus on general cognitive processes such as remembering previous knowledge about language or activating general world knowledge (Kucer, 1985, 2001). Too much concentration on one process and/or strong separation between them may lead to encapsulated knowledge that cannot be used indistinctly, and this seems to go against the principle of saving cognitive energy.

Conclusion

The empirical evidence provided helps us conclude that our research hypothesis are confirmed and that the assumptions are correct:

microstructuctural relations (the ones studied here) are the easiest relations comprehended and produced by this group of students; at the same time, argumentative text organization (superstructure) is not easy to manage by the 439 eighth graders. The highest positive and significant correlations are found in argumentative superstructure; this means that the strongest connections are detected in the schematic text structure. So, based in these results, we can offer new information on favor of the reading–writing relations, supported by comparable guidelines on argumentative discourse. The positive correlations between comprehension and production with an important degree of commonality are proofs of it. This means that the bidirectional hypothesis is confirmed as an interesting explanation of the results under analysis. At the same time, the analysis of our data leads us to confirm the existence of common basic strategies used by these 439 eighth graders when accomplishing writing and reading tasks, although more specific resources for each of the skills should be explored and detected.

These data contribute some empirical evidence collected from tests designed on similar discourse psycholinguistic grounds from text-oriented perspective. This information gives support to our initial questions that inquired about the potential existence of a general common cognitive system for both skills, though not denying the existence of some other more specific subsystems. This implies that the processes involved in both activities share some common knowledge-based strategies, yet to be determined in future research.

As pointed out at the beginning of this article, although we are certain we must move from correlational studies into more qualitative ones, the data collected has some degree of originality because it advances into the argumentative discourse and the parameters employed are more amenable to comparison. Of course, research should be conducted with empirical experiments on a multidimentional design, i.e., having proposed more than one line of data to help develop the objectives and support the information collected from one source of data or as this was called by Graesser et al. (1994b) the ''three-pronged method.'' There have been some lively debates over the proper measures and experimental designs that test whether or not reading and writing processes can be explored and compared from the same empirical and theoretical approach. However, in this article, we do not dissect the methodological problems with each of the existing measures and tasks. There does not appear to be a perfect measure and task; there are merely trade-offs, with each enjoying some benefits and some shortcomings. The decisions made for this research are based on empirical studies that, in our opinion, have minimal methodological problems and are supported by previous experimental research.

In relation to the students' achievement levels, it is important to emphasize the fact that, not only in Chile but also in several other Latin American countries as well as Spain and the United States, teaching practices currently in use do not seem to lead to the expected levels of language performance. The efforts being made to remove students from the social and cultural isolation in which they are immersed have shown little impact until now (Arnoux, Nogueira, & Silvestri, 2002; Felton & Kuhn, 2001; Golder & Coirier, 1994; Parodi, 2001, 2003, 2005a, b; Peronard et al., 1998; Sánchez & Álvarez, 1999). An educational reform is underway in Chile and in many other countries, and it would be desirable to take some adequate steps towards the consideration of discourse practices as the nucleus of the construction of meaning. Argumentation should be the focus of much investigation and the development of better teaching strategies. Also, the discourse approach in education should bring greater freedom in the access to knowledge and society.

Acknowledgement

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Appendix 1: Writing task

Taller de Escritura 1

Nombre:.....

Colegio:.....

Curso: 8° año básico Sexo: .....

En la actividad que viene a continuación, te invitamos a escribir un texto en el que te pedimos hacer tu mejor esfuerzo. Desde ya, agradecemos tu cooperación.

Actividad

Los directores de los canales de televisión han decidido que:

"Se eliminarán todos los programas acerca de deportes peligrosos".

Tú has sido elegido para comentar acerca de esta decisión en la nueva **Revista del Colegio**. Esta revista será enviada a los directores de los canales de televisión.

Usa estas dos hojas para redactar tu artículo a ser publicado muy pronto.

Tiempo asignado: 45 minutos aproximadamente.

Appendix 1: Writing task (translation)

Writing Workshop 1

Name:.....

School:.....

Level: 8th grade

In this activity, we invite you to write a text in which you are asked to do your best effort.

We appreciate your cooperation.

Activity

TV channels directors have decided that:

"All dangerous TV sport programs will be not be included any more".

You have been chosen to comment on this statement and write and essay for the new school journal.

This issue will be sent to TV channels directors.

You can use these two sheets of paper to write your text.

You are given 45 minutes for this task.

Appendix 2: Reading test and inferential questions

Sabías Tú Que...

(1) Desde la antigüedad, al hombre le ha gustado contemplar la belleza del mundo que lo rodea y gozar con los colores, formas y movimientos de todos los elementos de la naturaleza. Su mente inquieta lo ha llevado no sólo a observar el mundo, sino también a estudiarlo científicamente a través de diversos medios a los que puede recurrir. Sin duda, entre los múltiples avances científicos, los instrumentos que registran imágenes son algunos de los inventos que más han contribuido al desarrollo de la ciencia.

(2) Pocas personas han pensado en la importancia de los instrumentos que registran imágenes. Sin embargo, resulta interesante pensar en los beneficios que trae consigo esta actividad. Durante años, las personas morían de lo que, al parecer, era un dolor de estómago. Actualmente, muchos enfermos pueden mejorar gracias a que la

ecotomografía, permite examinar el estómago del paciente. También es posible detectar tumores cerebrales con aparatos tan valiosos como el escáner. Además, hoy es posible controlar las etapas del embarazo y comprobar el crecimiento del feto con instrumentos especiales. Se puede decir que los instrumentos para registrar imágenes han contribuido a detectar a tiempo problemas relacionados con la salud.

(3) Para estudiar el interior del cuerpo humano, los científicos inventaron la ecografía, lo que resultó ser un aporte esencial para los ginecólogos. Estos últimos están interesados en el crecimiento del feto. Este procedimiento entrega datos precisos del desarrollo del ser que está por nacer. E incluso, durante el embarazo, permite obtener información acerca de la maduración del aparato respiratorio, que resulta fundamental para que el cuerpo humano funcione. La inmadurez del sistema de respiración impide que el recién nacido pueda sobrevivir. Durante mucho tiempo no se supo cómo resolver este problema. Hoy en día, los médicos mantienen al bebé en incubadoras por el tiempo que sea necesario.

(4) Por otra parte, se puede mencionar otra contribución de los instrumentos que captan imágenes. Por medio de ellos se ha podido registrar el movimiento de los astros en el espacio, a menos que las condiciones atmosféricas no sean las mejores. Como ocurrió, por ejemplo, con el eclipse del año 1998. Los astrónomos se concentraron en el norte de Chile para observar mejor este fenómeno, debido a la claridad de su cielo.

(5) Los científicos dedican gran parte de su tiempo a describir el universo. G. Dupont ha realizado uno de los avances más interesantes en el área. Este científico demostró que se podía fotografiar una sola imagen del universo con la ubicación de miles de estrellas. Debido a este descubrimiento, los investigadores franceses han podido observar algunos astros tal como se ordenan en el universo. Esta tarea es una de las metas que se ha planteado la astronomía. Sin el uso de la fotografía, se habrían demorado meses en ubicar estas estrellas en un solo mapa.

(6) Sin importar las técnicas empleadas, es indudable que los instrumentos que registran imágenes han permitido el avance científico en diversas áreas. Se puede esperar que en un futuro cercano, el hombre sea capaz de inventar instrumentos con un nivel tecnológico cada vez más especializados. Estos avances permitirán a los investigadores descubrir cosas insospechadas hasta ahora.

Open questions:

1. De acuerdo con el texto, ¿qué procedimiento entrega datos precisos del desarrollo del ser que está por nacer?
2. ¿Cuál es la idea principal del párrafo 4?
3. Según el texto, ¿qué desea probar el autor?
4. Señala las razones más importantes que da el autor para probar la respuesta anterior.
5. De acuerdo con el texto, ¿por qué los médicos mantienen al recién nacido en incubadoras?
6. ¿Cuál es la idea principal del párrafo 2?
7. De acuerdo con el texto, ¿a qué conclusión llega el autor?
8. Según el texto, ¿quiénes se habrían demorado meses en ubicar todas las estrellas en un mismo mapa?
9. Escribe un resumen del texto en tres líneas.

Appendix 2: Reading test and inferential questions (translation)

Do you know that...?

(1) From old times, man liked to look at the beauty of the world that surrounds him and enjoy the colors, forms and movement of the nature elements. His wondering mind has taken him not only to observe the world but also to study it scientifically through different devices. Of course, devices that help capture images are some of the most incredible scientific advances and they have contributed much to science development.

(2) Few people have thought about the importance of the devices to register images. However, it is interesting to consider the benefits that they bring with them. During years, people died due to what thought stomach pain. Nowadays, many ill people can get better thanks to echotomographies that allow doctors to examine the patient's stomach. Also, it is possible to detect brain tumors with devices such as scanners. Besides, it is possible to control the baby growing in the mother's womb and to exam the baby's healthy growing up. It is possible to say that these special devices to capture images have contributed immensely to detect on time health problems.

(3) To study the inner part of the human body, scientists invented the echography, which turned out to be a tremendous help for doctors.

They are very much interested in the healthy growing of the fetus. This procedure gives the doctor precise information of the baby. During pregnancy, it helps get information about the maturity of the baby's breathing system, which is fundamental to keep the human body working properly. The breathing system immaturity is a major cause of death among babies. During a long time, there were no answer to solve this problem; nowadays, doctors keep immature babies in special devices until they are big enough to survive.

(4) On the other hand, it is also possible to mention another contribution of the devices that captures images. Using them properly, far away stars have been studied in detail, given the adequate weather conditions. For example, during the year 1998 scientists gathered together in the South of Chile to observe an eclipse, due to the special and clear sky of this region.

(5) Scientists spend a lot of time describing the universe. G. Dupont has produced one of the most interesting advances in this area of research. This scientist demonstrated that he could get with only one photograph of the universe the position of a lot of stars. Due to these findings, French researchers have been able to observe some stars in the right order in the universe. This step is only one of the many tasks that astronomy is interested in. Without the use of photographs, it would have taken lots of months to find the right place of some stars in just one map of the universe.

(6) No matter what kind of technique could be used to get images, it is undoubtedly true that without these devices the scientific advance would have not been the same in many research areas. It can be expected that in a near future man will be able to invent technological devices each time more specialized. These advances will help researchers discover unexpected unthinkable things.

Open questions:

1. According to the text, which procedure does give precise data about the evolution of the baby?
2. Which is the main idea of paragraph 4?
3. According to the text, which is the author's purpose?
4. Explain the most important reasons given by the author to prove his thesis.
5. Why do doctors keep babies in special machines after having been delivered?
6. Which is the main idea of paragraph 2?
7. According to the text, which is the author's conclusion?

8. Based on your reading, who would have taken months in searching stars in the same map?
9. Write a summary of the text in three lines.

Appendix 3: Scoring guideline for argumentative discourse (reading and writing)

Level	Scoring		Total	
Microstructural				
Nominal co-reference	1	3	5	5
Nominal ellipsis	1	3	5	5
Cause–effect relation	1	3	5	5
Macrostructural				
Macroproposition 1	1	5	9	9
Macroproposition 2	1	5	9	9
Topic	1	5	9	9
Superstructural				
Thesis	1	5	9	9
Arguments	1	5	9	9
Conclusion	1	5	9	9
Total Test	69			

Explanation: The scoring numbers were organized according to the weight we wanted to give to each psycholinguistic skill involved. Therefore, local coherence was given a maximum of 5 points for each feature (total 15). Macrostructural and superstructural levels, because of their higher importance in discourse processing, were given a maximum of 9 points (total 27). The numbers 3 or 5 in the medium scale were given when the expected process was not wrong but the answer was incomplete or the text produced was partly cohesive or coherent at the required level.

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