Proffering a discourse in different communicative contexts

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Abstract

Communicative contexts may affect how the speaker proffers a discourse. In particular, we assumed that uni-directional (as compared with bi-directional) and audio (as compared with audio-visual) contexts induce the speaker to elaborate and then use an articulated mental model of the discourse because they do not allow the exploitation of all the communicative means. Unidirectional contexts do not allow recovery of communicative failures, and audio contexts do not allow access to extralinguistic communication. The results of an experiment involving 84 adult participants confirmed the predictions deriving from these assumptions: linguistic indices of the exploitation of an articulated mental model of the discourse are greater in uni-directional and audio contexts as compared with bi-directional and audio-visual contexts, respectively.

Keywords: Discourse production; Communicative contexts; Levels-of-processing; Mental models

1. Introduction

The literature on discourse production disregards the role of the communicative context. The present investigation focuses on uni-directional versus bi-directional, and audio versus audio-visual communicative contexts. Information and communication technologies offer several methods of improving contact in long-distance communication: unidirectional audio (e.g., radio), bi-directional audio (e.g., telephone), uni-directional audio-visual (e.g., television) and bidirectional audio-visual (e.g., video conferencing). We assumed that the different contexts would vary in terms of the relative complexity of discourse organization and production. Analyzing discourse organization and production in increasingly complex situations can be considered a way of overcoming the limits of the studies carried out within the cognitive science framework, namely a strong disregard for any

investigation of human-technology systems that could provide an integrative scientific understanding of their functioning (Greeno, 1998; Vera and Simon, 1993). In particular, we investigated the uni-directional versus bi-directional contextual dimensions because the latter offers the possibility of recovering communicative failure, but the former does not, and audio-only versus audio-visual because the latter context offers the possibility of exploiting the extralinguistic means of communication, whereas the former does not.

A main assumption of the present study is that the communicative context within which the discourse takes place affects the level at which the discourse content is processed. Craick and Lockhart (1972) and Lockhart and Craick (1990) proposed different levels-of-processing of information, from shallow (e.g., wording and syntax) to deep (e.g., semantics). From the levels-of-processing perspective, the proposals advanced in the literature to account for discourse comprehension can be considered on a continuum. The earliest proposals stress the relevance of propositional representations in accounting for comprehension, whereas later ones acknowledge the importance of more structured and elaborate representations like mental models. In our view, propositional representations are involved in a more superficial processing of the text than models: although propositional representations reflect a semantic level of processing, they cannot account for the significance of a text (see section 2). Hence, we assumed that in uni-directional and audio-only contexts the speaker is more likely to organize the discourse on an articulated mental model, in order to circumvent the reduced possibility offered by the communicative context. The organization of the discourse on a mental model reflects a deep processing of the discourse content and can be detected through linguistic indices in the discourse itself. The linguistic indices reveal that either superficial processing (i.e., construction of propositional representations/mental images) or deep processing (i.e., construction of an articulated mental model) of the discourse occurred.

In order to verify the predictions deriving from our assumptions we needed to limit our investigation to situations in which we could control the content of the discourse, otherwise it would have been hard to constrain an individual's discourse production. Thus, we focused on situations in which a person reads a text and is then invited to proffer a discourse concerning its content. In situations like this, our prediction can be re-formulated as follows. The text on which the speaker bases the discourse is processed at different depths as a function of the context within which the discourse takes place. This experimental procedure has a limitation. It does not allow us to distinguish between two possible ways in which the context may affect how a speaker proffers a discourse: either at the time of text coding, or at the time of text retrieval. The present investigation does not have the granularity, nor the aim of dealing with this point. Our aim is very preliminary

with respect to such issues, namely to ascertain whether the communicative context affects discourse production.

2. Levels-of-processing of a discourse: from shallow to deep

We assumed that different depths of processing of a discourse can be detected on a continuum, from shallow – at which the speaker organizes the discourse on a mental representation in a propositional format – to deep – at which the speaker organizes the discourse on an articulated mental model of its content.

Kintsch and van Dijk (1978) assumed that a text can be represented as a set of separate propositions and advanced an influential theory of text comprehension. The first phase of comprehension is concerned with the 'microstructure' of the text, in that individuals establish referential links between the propositions. The memory buffer allows individuals to consider only a certain chunk of propositions within the text. When the same argument is found in both the buffer and the input chunk, the arguments are linked together as co-referential. If there is no argument in common, an inference has to be made in order to create a proposition that connects the input chunk to those propositions that have already been processed. The final result of representing the whole text in this way is to produce a graph representing all the referential links between the propositions. However, a chain of co-references is not enough to render a text well formed (see Van Dijk, 1977) and, in a second phase of text processing, various operations are carried out on the microstructure of a text in order to yield its 'macrostructure', namely a unifying topic around which it is organized. Thus, according to Kintsch and van Dijk, when reading a text individuals construct a mental representation in a propositional format close to the linguistic form (also see Just and Carpenter, 1980). They suggested that general strategies such as retrieving and applying causal relations guide the construction of such networks of propositions.

Johnson-Laird (1983) pointed out that a theory of text comprehension that relies on a propositional format may account for a representation of the linguistic form of the sentences, but not for a representation of their significance. Thus, for example, the theory proposed by Kintsch and van Dijk cannot account for those cases in which two propositions have overlapping arguments but are not co-referential (e.g., ''Roland's wife died in 1928. He married again in 1940. His wife now lives in Spain.''). Nor can the theory account for propositional representations that have no overlap in their arguments but refer to the same entity (e.g., ''the morning star, Venus, the evening star''). Johnson-Laird concluded that a superficial propositional representation is necessary to capture the linguistic form of these descriptions, but it cannot do double duty and represent what they refer to.

However, the distinction between a representation of the sense of a text and a representation of its significance (including what it refers to) is crucial to the way in which people understand and recall the text itself. Johnson-Laird (1983) and van Dijk and Kintsch (1983; an extension is the CI Model of Comprehension, Kintsch, 1998) claimed that in addition to surface and propositional representations, we have a third memory representation of text called a ‘‘mental model’’, or ‘‘situational model’’. We considered the two terms to be equivalent, disregarding their different theoretical roots (see also Kaup et al., 1999). Under such terms, mental models are conceived as the mental representation of a verbal description of some real or fictional state of affairs. A propositional representation, which represents the meaning of a text, captures its sense, whereas a mental model, which represents the state of affairs to which a text refers, captures its significance. The text is initially represented at a propositional level, i.e., by expressions in a mental language and, subsequently, at the deeper level of a mental model.

Mental models have been invoked as an important explanatory principle for comprehension processes at a text/discourse level (Garnham, 1999; McNamara et al., 1991). In particular, according to the mental model theory, or model theory for short, advanced by Johnson-Laird (1983; Johnson-Laird and Byrne, 1991), the construction and manipulation of models account for the human ability to deeply comprehend and reason and, indeed, language comprehension and reasoning are two main areas of application of the model theory (see Garham, 1997). Following the tenets of the theory, we assumed that deep comprehension requires the most complete representation of themeaning of the text, and thus that the reader must build a mental model of the information in the text (also see Bucciarelli, 2007; Cutica and Bucciarelli, 2008). The model theory allows us to account for the human ability to comprehend and learn from a text in that it can account for the way in which the reader has to make sense of a string of information within a consistent system of meanings and beliefs (see, e.g., Johnson-Laird et al., 2004) and hence construct models from which inferences can be drawn. Themodel theory claims that individuals constructmodels when they have to drawinferences. In particular, in text comprehension, through the construction of models the reader can infer information that was only implicit in the original material. The construction of models is effortful with respect to the encoding of the same information through propositional representations (i.e., simple verbal comprehension), but it recompenses in terms of the possibility of drawing inferences, which is crucial in text comprehension.

Graesser et al. (1994) advanced an account for knowledge-based inferences that are constructed when readers comprehend narrative text. A main assumption of the author is the

'Search (or effort) after meaning principle', according to which readers attempt to construct a meaning representation that addresses their goals. In particular, these goals and meaning representations are normally pitched at deep levels-of-processing rather than at shallow levels. Moreover, the principle states that readers attempt to construct such a representation as coherent at both local and global levels, and as a representation that explains why actions, events, and states are mentioned in the text. The model theory account of model construction and inference is broadly consistent with the text processing perspective illustrated so far. As Rader and Sloutsky (2002:61) pointed out, ''the mental model theory suggests that premise representations are logically incomplete because of working memory limits and relevance considerations (Johnson-Laird and Byrne, 1991), but these factors also allow participants to consider as few possibilities as possible. In text comprehension, a major goal is to build a coherent representation (Gernsbacher, 1997; Kintsch, 1998; McKoon and Ratcliff, 1992; Zwaan and Radvansky, 1998), and minimizing possibilities to be considered could be one way to enhance coherence''. Rader and Sloutsky pointed out that the model theory accounts for a series of further findings in text processing literature (see, e.g., Singer, 1994).

The construction of a mental image is also a case of superficial processing. Some studies have pointed out that images are useful aids to memory and learning (Paivio, 1971; Bower, 1972). However, recent studies run against the claim that image constructions necessarily lead to better recollection. Indeed, for example, an event that is only imagined is remembered as if it had actually happened (Hyman and Pentland, 1996; Johnson and Raye, 1981) and encoding words with an emphasis on imagery increases the number of errors when the individual later tries to remember whether particular items were seen as words or pictures (Durso and Johnson, 1980; Lane and Zaragoza, 1995). In contrast to visual images, mental models can represent any possible situation and can abstract away from such visual details as colors, textures, and shapes (Johnson-Laird, 1983; Johnson-Laird and Byrne, 1991; Knauff, 1999). In sum, visual images represent information in a modality-specific format, whereas spatial models are abstract and not restricted to a specific modality. Mental models differ from mental images in that a model represents a series of states of affairs, whereas an image represents one state of affairs.

A main difference between images and models, which is relevant to our study, is that mental models support the production of *text-based inferences*, whereas an image can support the addition of details absent in the material to be learnt, namely *elaborative inferences* (Singer, 1994). Such inferences can be distinguished from pure erroneous recollections in that they constitute a sort of enrichment of the original text. When the specific task requires an individual to recollect the

information provided in the text (either explicitly or implicitly), the production of elaborative inferences in the recollection phase penalizes the individual's performance. Elaborative inferences might also derive from a propositional representation of the text. This possibility is consistent with the situated simulation theory of concept representation advanced by Barsalou (1999, 2003). He argued that conceptual representations are modal, that the same types of representations underlie perception and conception. Thus, when the conceptual system represents an object's visual properties, it uses representations in the visual system, and when it represents the actions performed on an object, it uses motor representations (Barsalou, 2003). Such claims are relevant to our study, in that ''the conceptual system provides elaboration at encoding, organizational structure in storage, and reconstructive inference at retrieval. In language, the conceptual system contributes to the meanings of words, phrases, sentences, and texts, and to the inferences that go beyond them.'' (Barsalou, 2003:515). However, a crucial assumption of the present study is that elaborative inferences denote superficial processing of a text, and this assumption is consistent with both sorts of superficial processing: construction of either mental images or propositional representations.

Different sorts of recollections of the information provided in a text denote a different level or depth of their processing. In particular, they may reflect either the construction of an articulated model of the text (text-based inferences) or a less articulated model (elaborative inferences, errors). As regards correct recollections, these may consist in either literal recollections or paraphrases. They do not necessarily reflect the construction of an articulated model of the discourse.

3. Levels-of-processing of a discourse as a function of the communicative context

An explanation of the mental processes involved in proffering a discourse ought to take into account the possible influences of the context within which the discourse occurs. Discourse production involves the co-construction of meanings by the participants in thecommunicative process (see, e.g., Clark, 1996).Some communicative contexts within which discourse may occur offer the speaker the possibility of repairing possible communicative failures to reach mutual understanding (Bosco et al., 2006). In particular, a bi-directional context offers the speaker the possibility of making clarifications, objecting to criticisms, and so on, whereas a uni-directional context does not. Moreover, some communicative contexts are richer than others because they offer the speaker the possibility of exploiting both the linguistic and the extralinguistic communicative means (see, e.g., Bara, 2005; Bucciarelli et al., 2003). In particular, an audio-visual context offers the speaker the possibility of exploiting bothmeans, whereas an audio-only context does not. In general, uni-directional and audio contexts prevent full exploitation of all the communicative

possibilities and means. Thus, we assumed that the speaker processes the discourse content more deeply when the discourse occurs in unidirectional as compared with bi-directional communicative contexts, and in audio as compared with audio-visual communicative contexts. Since our predictions were limited to situations in which we could control the content of the discourse, we constrained the production of discourse by the participants in our experiment by inviting themto read a text and then proffer a discourse concerning its content. In such situations, our prediction can be re-formulated as follows. In uni-directional and audio contexts, as compared with bi-directional and audio-visual contexts, participants produce more text-based inferences and fewer errors in their discourse. These indices reflect a deep processing of the discourse content. Also, if uni-directional and audio contexts favor the exploitation of a mental model of the text, we might expect such an effect to be augmented in uni-directional audio conditions, as compared with bi-directional audio-visual conditions.

Note that we are concerned with the depth of processing, which does not necessarily result in better performance in proffering a discourse. Indeed, there are communicative situations (for example situations in which the content of the discourse must strictly reflect the content of a text, namely discourse verbatim) in which superficial processing of the discourse might be more beneficial than deep processing.

3.1. Experiment

3.1.1. Material and procedures

The experimental material consisted of four stories from the Rivermead test (Wilson et al., 1990), designed to assess memory skills related to everyday situations. The test includes nine subtests; we used the ‘Story recall’ subtest, which comprises four stories, each consisting of 21 concepts or semantic units (see Appendix A). News stories were adepte to favor participants’ deep processing of the material constituting the content of the discourse (see Zwaan, 1994). The material also included the Italian version of the Verbal Passive Task described by Spinnler and Tognoni (1987). In this task increasingly long sequences of disyllabic words are read by the experimenter and verbally reproduced by the participant. The span value represents the length of the longest sequence of words correctly recalled by the participant. We included this task in the experimental material for two purposes: first, the task interferes with any attempt to mentally rehearse the verbatim of the four stories; second, this task allowed us to exclude the possibility of participants in different experimental conditions differing in terms of their verbal memory span, therefore in their ability to comprehend a text (see Just and Carpenter, 1992).

The experiment consisted of three phases. First, participants were invited to study the four written stories from the Rivermead test in order to proffer a discourse on them later on in a specific communicative context specified by the experimenter. In particular, one-third of the participants were randomly assigned to a control condition, one-third to a Uni-directional condition, and one-third to a Bi-directional condition, for a total of 28 participants in each condition. Moreover, within each condition, half of the participants were randomly assigned to an Audio sub-condition, and half to an Audio-visual sub-condition. Thus, there were 14 participants in each of the following conditions: control-audio, control-audio-visual, uni-directional-audio, uni-directional-audio-visual, bi-directional-audio, bi-directional-audiovisual.

In the control condition, participants were not presented with a discourse in a proper communicative context: they were told that later on they would be invited to recall as much information as possible. The control condition was subdivided into Audio and Audio-visual sub-conditions:

Control-Audio: ‘‘Read the four stories one after the other. Later on, you will be asked to re-tell them in a comprehensible way. You will be audio-recorded’’.

Control-Audio-visual: ‘‘Read the four stories one after the other. Later on, you will be asked to re-tell them in a comprehensible way. You will be video-recorded’’.

In the two experimental conditions, Uni-directional and Bi-directional, participants were faced with the task of explaining to someone else what they had understood:

‘‘Read the four stories one after the other. Later on, you will be asked to re-tell them in the most comprehensible way’’.

The additional instructions given to the participants varied depending on the Audio and Audio-visual sub-conditions:

Uni-directional-audio: ‘‘You will be audio-recorded and, later on, some people will listen to the audio-recording and say whether they have understood or not’’.

Uni-directional-audio-visual: ‘‘You will be video-recorded and, later on, some people will watch the videorecording and say whether they have understood or not’’.

Bi-directional-audio: ‘‘You will be audio-recorded, and some people, who are in the room next door, will listen to the live broadcast of you telling the stories, and if they do not understand they will ask you some questions’’.

Bi-directional-audio-visual: ‘‘You will be video-recorded, and some people, who are in the room next door, will watch the live broadcast of you telling the stories, and if they do not understand they will ask you some questions’’.

The stories were presented in two different random orders in each of the six conditions. If we consider the four versions of the Rivermead stories, as named in Appendix A, random 1 involved presenting the stories in the order: A, B, C, D; random 2 involved presenting the stories in the order: D, C, B, A. Whenever the participants had problems in remembering one of the stories, the experimenter prompted him/her by saying the words in the first concept of the story. After studying the stories, the participants were presented with the Verbal Passive Task. Finally, in the third phase the participants were invited to talk about the four stories in a discourse. They were either audio-recorded or video-recorded, depending on the condition.

The discourses proffered by the participants were analyzed as follows. Each participant's discourse was transcribed. In particular, each recollection concerning the information in the original text was evaluated by two independent judges as referring to a specific semantic unit in the stories. Each semantic unit recalled by the participants was evaluated according to the following coding schema:

- Correct recollection: a semantic unit recollected either in its literality or as a paraphrase.
- Text-based inference: a recollection in which the participant gave explicit information that was originally implicit in the semantic unit.
- Elaborative inference: a semantic unit recollected with the addition of plausible details.
- Erroneous recollection: a recollection with a meaning that was inconsistent with the semantic unit.

Consider, for instance, the following semantic units (separated by slashes) in story A: ''Mr. Alberto/ Fossati/, a guard/, was killed/ on Monday/ during a bank robbery/ in Perugia/. The four robbers/ were all wearing masks/''. According to the coding schema, the statements ''a guard'' and ''was the victim'' were correct recollections; the statements ''(the robbers') faces were covered'' and ''(the guard was killed) at his place or work'' were text-based inferences; the statements ''in Pisa'' and ''the two robbers'' were erroneous recollections. Now consider the following semantic units in story C: ''Two hundred employees/ from a shipyard/ in Savona/ went on strike/ this morning/. They are protesting against/ the dismissal/ of fifty/ laborers/.''; according to the coding schema, ''Two hundred workmen'' and ''came out onto the streets'' were elaborative inferences.

The two judges discussed each recollection they had independently evaluated as pertaining to different categories, until reaching full agreement. The maximum number of recollections a participant could obtain was 21 for each story, as each story consisted of 21 semantic units. This outcome was guaranteed notwithstanding the fact that the participants drew inferences (both text-based and elaborative). Indeed, for each semantic unit, the two judges ascertained whether it was a

correct recollection, a text-based inference, an elaborative inference, or an erroneous recollection. Thus, each recollection was only associated with one of the semantic units in the original texts. For example, if the semantic unit ‘An enormous oil slick’ was recollected as ‘An oil slick polluted the sea’ the entire recollection was considered a text-based inference. Again, consider for example the semantic unit ‘‘Two tundre employees’’ recollected as ‘‘Two hundred workers’’: the recollection was considered an elaborative inference. The shortness and incisiveness of the stories worked against the production of a number of inferences (either text-based or elaborative) exceeding the number of the semantic units that could be recollected in principle.

3.1.2. Participants

The participants in the experiment were 84 students (74 females and 10 males, mean age: 22 years) from the University of Turin, attending a course of General Psychology. They took part in the experiment on a voluntary basis, individually, in a quite room, and in a single session.

3.1.3. Results

The participants assigned to the six conditions did not differ in terms of their verbal memory span (mean span: 4.65, one-way ANOVA: $F = .91$, $p = .48$; post hoc tests: Fisher’s PLSD = p value ranging from .08 to .80). Thus, we can assume that possible differences in their performance were not due to differences in verbal memory span. The order in which the four stories were presented did not affect participants’ performance. Participants in random 1 recollected a mean of 35 concepts, and participants in random 2 recollected a mean of 36 concepts (Un-paired t-test: $t = .26$, $p = .80$). Thus, we pooled the results.

As regards the time employed to learn the four stories (an average time of 2 min), the results revealed no difference between the six conditions (Un-paired t-test: p varied from .99 to .27), nor any difference between the Control, Unidirectional and Bi-directional groups (Un-paired t-test: p varied from .96 to .63).Within the Control group the results revealed no difference between the Audio and Audio-visual conditions (Un-paired t-test: $p = .84$), and the same result held within the experimental groups (Un-paired t-test: $p = .42$).

Table 1 illustrates the mean number of sorts of recollection in the six conditions of the experiment. For clarity of exposition we have summarized these detailed results by adopting the term context in place of the term sub-condition.

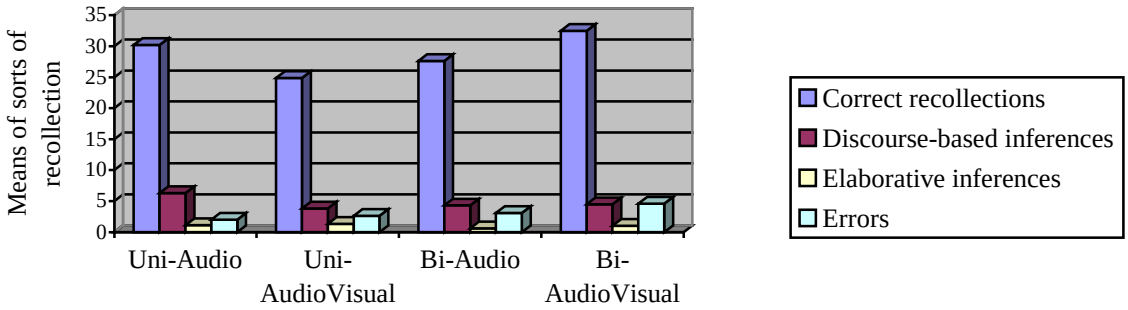
Table 1. The mean number of sorts of recollection in the six conditions of the experiment (with N = 14 in each condition and considering the 84 semantic units of the four stories).

Contexts	Correct recollections	Text-based inferences	Elaborative inferences	Errors
Control-Audio	27.4	2.9	1.0	2.3
Control-Audio-visual	24.4	3.5	1.0	1.7
Uni-Audio	30.2	6.3	1.1	2.0
Uni-Audio-visual	24.9	3.8	1.3	2.6
Bi-Audio	27.6	4.3	0.6	3.1
Bi-Audio-visual	32.5	4.5	1.0	4.6

A series of *t*-tests for dependent samples revealed that, in line with our expectations, there were more Text-based inferences than Errors in the Uni-directional audio and audio-visual context ($t(13) = 3.9$ and 2.6, $p < .002$ and $< .03$, respectively), but not in the Bi-directional audio and audio-visual contexts ($t(13) = 1.4$ and .1, $p = .20$ and .91, respectively).

Fig. 1 illustrates a histogram of the mean number of sorts of recollection detailed for the four experimental conditions. A series of t-tests for independent samples detected the following statistically significant differences.

Figure 1. Histogram of the means of sorts of recollection in the experimental conditions of the experiment.



3.1.4. Audio versus Audio-visual contexts

As predicted, in the Uni-directional condition, participants in the Audio context produced a greater number of Textbased inferences than participants in the Audio-visual context ($t(26) = 1.9$, tied $p < .04$). The other statistical comparisons yielded non-significant differences ($t(26)$ value varied from 1.1 to .5, p value varied from .29 to .62). In the Control and Bi-directional condition,

participants in the Audio context produced comparable numbers of all sorts of recollections (t(26) value varied from .00 to 1.5, p value varied from 1 to .15).

3.1.5. Uni-directional versus Bi-directional contexts

In the Audio context, participants in the Uni-directional condition produced fewer Errors than participants in the Bidirectional condition ($t(26) = 2.0$, tied $p < .03$). The same result held for the Audio-visual context: participants in the Uni-directional condition produced fewer Errors than participants in the Bi-directional condition ($t(26) = 1.8$, tied $p < .05$). The other statistical comparisons yielded non-significant differences (t(26) value varied from .52 to 1.52, p value varied from .61 to .14).

3.1.6. Uni-directional Audio context versus Bi-directional Audio context

Participants in the Uni-directional Audio context produced fewer Errors than participants in the Bi-directional Audio context ($t(26) = 2.6$, tied $p < .008$). The other statistical comparisons yielded non-significant differences (t(26) values varied from 1.42 to .43, p value varied from .17 to .67).

4. Discussion and conclusions

We predicted that in both the Uni-directional and Audio contexts participants would be more likely to exploit an articulated mental model of the discourse than in Bi-directional and Audio-visual contexts. The results of the experiment partially confirmed these expectations. In particular, the hypothesis that Uni-directional contexts would lead to a greater exploitation of a mental model than Bi-directional contexts was confirmed by two main results. First, participants produced fewer Errors in the Unidirectional context, as compared with the Bi-directional context. Second, there were more Text-based inferences than Errors in the Uni-directional audio and audio-visual contexts, but not in the Bi-directional audio and audio-visual contexts. Further, the hypothesis that Audio contexts would lead to greater exploitation of a mental model than Audiovisual contexts was confirmed by a main result: learners produced more Text-based Inferences in the Uni-directional Audio context than in the Uni-directional Audio-visual context. An explorative comparison involving the different sorts of recollection in the Uni-directional Audio context and the Bi-directional Audio-visual context, revealed that participants produced fewer Errors in the former. Thus, some, but not all of the predictions were confirmed. A plausible explanation is that the material used in the experiment might not have engaged the participants in a deep processing of the text, as testified by the majority of participants' recollections in the form of Correct recollections

(i.e., literal recollections or paraphrases). However, while the material may have weakened the effects produced by the experimental conditions, it did not invalidate them.

In general, the communicative context in which the speaker is more likely to exploit a mental model of the discourse is the Uni-directional Audio context. In such a context, the speaker produces fewer Errors than in the Bi-directional Audio-visual context. Although our Bi-directional Audio-visual context is not directly comparable with the classic face-to-face context involved in standard communicative environments, it is ironic to think that the contexts that tend to enhance a greater exploitation of a mental model are exactly the opposite: Uni-directional Audio contexts. Whether the increased likelihood of the speaker exploiting a mental model of the discourse results in better comprehension of his/her discourse by the listener has yet to be investigated. A further issue that might be investigated is whether the context affects the construction of a model of the discourse at time of encoding or the exploitation of a model of the discourse at time of retrieval, or both.

One of the main assumptions underlying this study was that deep comprehension is an activity strictly interconnected with inferential processes. Although this claim seems obvious, the literature on discourse processing tends to disregard theoretical acquisition within the reasoning literature. Following the tenets of the model theory we attempted to reconcile some theoretical acquisitions on discourse processing and reasoning.We assumed that building and therefore exploiting a mental model of the text or discourse involves processing the information in the text at a deeper level, whereas building propositional representations or images corresponds to superficial processing. The level at which an articulated mental model is exploited is revealed by the sort of linguistic indices present in the discourse. The lesson we may learn from this study (the generality of the lesson has yet to be proved) is: when you have to process a text in order to proffer a discourse based on its content you process the information by adopting the perspective of a uni-directional audio communicative context. A caveat that at this point of the manuscript ought to be obvious is: provided the specific task at hand does not give value to the memorization of text verbatim.
As a final consideration, the studies in the learning literature tend to disregard an experimental approach to deep analysis and comprehension of the learning contexts. Even the widespread claim that the use of technologies in the learning context favors learning has no experimental support. The possible implications of the result of the present study for the construction of learning environments where information technologies are exploited stress the need for controller experiments (but cf. Winn, 2002). This is a case where theoretical advances have clear pragmatic implications. In

particular, our knowledge concerning the possible effects of the communicative context and technologies on deep comprehension and learning, could support meta-intervention on the learner, as well as on the teacher.

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Appendix A

The four stories of the Rivermead test. In the Italian version of the test, each story consists of 65 words and 21 concepts or semantic units.

Version A.

Mr. Alberto/ Fossati/, a guard/, was killed/ on Monday/ during a bank robbery/ in Perugia/. The four robbers/ were all wearingmasks/ and one also/ had a hand-gun/with a silencer/.Last night/ the police/ gathered/ eye-witness accounts/.One man who was there said:/ ‘‘He was really very brave/. He chased/ the armed robbers/ and sparked a fierce gun battle’’/.

Version B.

Firemen/ and volunteers/ worked throughout the day/ yesterday/ to put out/ a huge fire/ in Tuscany/ 6 kilometers/south/ of Siena/. Fire engines/ were unable to reach the scene/ and so fire-fighting equipment/ was brought in by helicopter/. Livestock/ were evacuated/ from the nearby/ farm owned by Mr. Mollica/ which was engulfed/ by a thick cloud /of white smoke/.

Version C.

Two hundred employees/ from a shipyard/ in Savona/ went on strike/ this morning/. They are protesting against/ the dismissal/ of fifty/ laborers/. Trade union representative/ Mr. Giovanni/ Ornaghi/ told journalists at the site:/ ‘‘It’s disgraceful!/ the company has orders/ for the next two years’’/. A company executive said/ ‘‘We hope to begin/ a new round of talks/ with our head office/ tomorrow’’/.

Version D.

A Dutch/ petrol tanker/ sank/ last night/ 10 miles/ off the coast of Leghorn/. The crew/ were rescued/ by a coast guard patrol boat/. An enormous oil slick/ has already started to build up/ and ecologists/ are concerned/ about the consequences/ on the environment. A group of local volunteers/ are preparing/ to rescue/ the birds/ that have been washed/ ashore/.

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