

Parallel Session 28: Discourse analysis contributions to PCST study

KNOWLEDGE, DISCOURSE AND SCIENTIFIC COMMUNICATION

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Abstract

In this communication we present some fragments of a new, multidisciplinary theory of knowledge as certified shared beliefs of epistemic communities and a typology of knowledge and epistemic communities, including scientific communities and the public as a whole, as a basis for a multidisciplinary study of popularization discourse. Besides transformations between different types of knowledge, popularization also involves recontextualization of knowledge from scientific to everyday knowledge. In a study conducted with Helena Calsamiglia, we analyzed press reports in Spanish newspaper *El País* about the presentation of the completion of the sequencing of the human genome and found that popularization not only features the usual discursive means of new knowledge introduction (such as definitions and metaphors), but also a limited set of fixed categories such as Location, Composition, Type, Size and Number, which link old with new knowledge. It is assumed that these categories are expressions of underlying schemas of knowledge representation.

Keywords: Discourse Analysis, Popularization, Knowledge

Text

Aim

The theoretical aim of this paper is to propose some fragments of a new theory of knowledge and its relations with discourse structures as a basis for new developments in the study of science communication. Its empirical aim is to apply this theory in a study of the popularization discourse in the Spanish press about the international presentation of the first draft of the human genome.

Theoretical framework

The theoretical framework of this research project is multidisciplinary, and involves discourse analysis, cognitive psychology and epistemology and their integration with the study of science communication. Cognitive psychology in the last decades has shown that discourse production and comprehension requires vast amounts of knowledge (Van Dijk & Kintsch, 1983). But it does not provide a general theory nor a typology of knowledge needed to explain which kind of knowledge is needed by and for which language users, as is the case for the knowledge and discourse of scientists, specialized journalists and the public at large in science communication in the press. Similarly discourse

studies of popularization have analyzed some textual structures used in these forms of scientific knowledge transformation and recontextualization, such as denominations, explanations, definitions, denominations and metaphors (Beacco, 1999; Calsamiglia, 2004). However, these studies have not been carried out on the basis of a cognitive psychology of text processing and within a broader theory of knowledge and its uses.

Against this multidisciplinary background, this paper proposes a new framework for the theory of the knowledge-discourse interface and its integration within a theory of science communication. Thus, unlike definitions in classical epistemology, knowledge is not defined in terms of “justified true beliefs” (Bernecker & Dretzke, 2000), but more pragmatically, discursively and socioculturally, namely as the shared beliefs of (epistemic) communities that are certified by the (epistemic) criteria of that community (for details, see Van Dijk, 2003). That is, knowledge is relative to communities, and maybe deemed ‘mere belief’ by other communities, or later by the same community. Besides such a socioculturally relative definition, it is also proposed that we need a typology of knowledge, distinguishing, e.g., between general vs. specific or abstract vs. concrete, various represented in episodic and semantic (social) memory. Since knowledge as defined here is social, it is also proposed to define different ‘scopes’ of knowledge, such as interpersonal, group, national and cultural. Crucial for the interface between knowledge and discourse is the general pragmatic strategy that the knowledge of a K-community is presupposed in the discourses within that community. For communication across community boundaries, special forms of communication and strategies of knowledge transformation are necessary, as is the case in popularization, i.e., between scholars, journalists and the public at large. These strategies are defined in the K-device of the episodic context models that regulate all discourse and communication and that subjectively construct the relevant aspects of the communicative situation.

The Study

In order to examine some of the empirical implications of the theory, a study was carried out with Helena Calsamiglia (Calsamiglia & Van Dijk, 2004), analyzing Spanish press accounts of the announcement of the sequencing of the human genome in June 2000. Forty-two articles were systematically discourse analyzed for their relations between scientific (community) knowledge and everyday commonsense knowledge, and how their structures were involved in such transformation and recontextualization.

Results

Apart from the usual findings in discourse analytical studies of popularization discourse, such as the use of definitions, descriptions, explanations, paraphrases or metaphors, most interesting for our theoretical framework was the systematic *categorical* way in which ‘new’ knowledge was discursively introduced by the journalists. Since new knowledge can only be established by links with ‘old’ knowledge, what happens is that these links are defined in terms of a rather limited *categorical schema*, involving such relationships as Composition, Type, Size, Number, Form, Color, Variation, Generalization, Comparison and Denomination, as in “*The gigantic DNA is composed of millions of small compounds called bases*”, which features the categories

Composition, Number, Size and Denomination. Since these categories appear to be very generally used in definitions and explanations, and hence for the introduction of 'new' knowledge in general, we surmise that they might be part of the very schematic structures of knowledge representation.

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Parallel Session 28: Discourse analysis contributions to PCST study

ASTRONOMY TEACHING AT THE HIGH SCHOOL LEVEL FROM A HUMANISTIC APPROACH

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Abstract

The astronomy teaching is usually excessively technical and dissociated from the human aspect that feeds the great interest and curiosity that those themes arise. In this work we present a proposal aiming to contribute to revert such a picture. For that purpose we choose as opening issues the different views of the Universe: naïve, autochthon, and scientific. We develop practices, instructional materials and texts to make the adoption of a humanistic approach feasible to the astronomy teaching at the high school level. We applied our proposal in an in-service teacher's training course and the receptivity and results were very stimulating.

Key words: High School Education; Humanistic Approach.

Text

Introduction

There is an enormous shortage of astronomy didactic materials for high school teachers that particularly explore humanistic aspects of that subject. The origin of the Universe is a good example of that central conclusion. Although such an origin has had diverse cultural explanations, teachers usually do not have information about, besides lacking material to work on different world views and appropriate training to lead a proper classroom approach to those cosmogonic explanations.

Objectives

Our project in education must be seen as a practical trial to help the effective formation of citizens more integrated with themselves, the environment and the society they live in. Our aims go beyond a verbal and experimental astronomy

content for high school teenagers. The project intends to integrate activities that are play oriented and at the same time develop cooperation qualities and skills, respect for the others, respect for their opinions, besides including corporal activities (vivid and theatrical activities), going beyond plain physical concepts.

Methods

In this manner, the challenge of this project was to introduce other aspects of the human being into the learning of physics, in particular astronomy, which usually are not considered because of the adoption of excessively technical and mathematical approaches in exact sciences teaching.

Following what Howard Gardner has proposed (cf. Armstrong, 2001), we see that the human being has different intelligences. Those are cognitive capacities that allow the individual to learn and interact with the world. Therefore, there are other ways of learning besides the rational form, and those ways should have appropriate practices involving them within a discipline or among the disciplines traditionally present at the high-school level of formation.

We develop practices, instructional materials and texts to make the adoption of a humanistic approach feasible to the astronomy teaching at the high-school level, an approach in which the humanistic and scientific cultures could be integrated in a contextualized and efficient way for that level of teaching.

Results

We further criticize the fragmental, positivistic, individualistic and competitive model of education that is so common in most high schools. Such an educational model is more worried with the selection of students to enter university than with their formation as a person. In our view, fragmentation only brings more fragmentation and this puts the individuals apart from the society they live in.

We propose the opposite, the integration and cooperation between the individual and herself/himself, the others and the society. In order for this to happen our “trick” is to put together classes involving the recovering of cultural contents. For that purpose it was chosen some indian cultures to enrich the teaching of astronomy, to compare with the Greek astronomy.

The objectives are to stimulate the comprehension of how different people elucidate the same phenomenon and also to make explicit the human being capacity of elaborating models: religious, philosophical or scientific. Each one attending one aspect of the human being, without the possibility of choosing the best, because the model has something transitory in its structure that the school unfortunately does not work with. Schools adopt the (current) scientific model as if it was the absolute truth when, in reality, we already learned from history of science examples that models are usually replaced by others.

Among other things that our project works with, we point out the following activities: 1) The sky representation made with paint sprinkled on a paper, showing that the formation of the constellations is, in reality, the look we give to those random spots, to form figures that make sense for our culture; 2) The theatrical activity with texts of different cultures and times [Brazilian Tupi-Guarani indians; Indian “Nasadasiyasukta” of the Rig Veda; Biblical Genesis; and a scientific one (Big Bang)]; this activity involves the body as an expression vehicle of learning, and highlights that the knowledge construction is made through models; and 3) The Brazilian Tupi-Guarani dance of the IEAOUY shows how another culture enters into connection with sky elements not standing off from them but considering themselves as children of the Sun and the Moon, and how this conception creates a less aggressive view for nature.

We point out the following results from that educational experience: The production of activities guidelines; The development of specific pedagogical practices (e.g., myth staging; indigenous Guarani primordial dancing; constellations "creation" and multicultural interpretations; etc.); and Concrete suggestions for the effective accomplishment of a contextualized and interdisciplinary teaching practice, where cosmogonic questions serve as an inspiration to motivate and initiate such a practice.

We applied our proposal in an in-service training course for public school teachers of several subjects. Their receptivity to that approach and the educational results obtained were very encouraging. They clearly indicate how the adopted approach may train teachers for world readings that naturally include cultural, social and historical aspects within the usual curricula subject themes to be taught. [See Benevides and Jafelice (2004) for further comments].

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Parallel Session 28: Discourse analysis contributions to PCST study

THE SKY IN THE INDIGENOUS ORAL TRADITION IN THE RIO GRANDE DO NORTE STATE, BRAZIL

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Abstract

We develop an ethnoastronomical research with indigenous descendants from the Rio Grande do Norte State (RN), in the Northeast of Brazil. We discuss their knowledge about, and relationship with, sky objects and phenomena. We adopt the ethnographic method. Our objectives are: to contribute to rescue the identity of the RN indigenous population and to propose procedures to use a holistic anthropological approach for scientific education in multicultural communities. A preliminary conclusion is that among the remained indian descendants the affinity with celestial phenomena is greater and sensibly more present in their quotidian talks compared to the rest of the population.

Key words: Autochthon Knowledge; Holistic Education.

Introduction

We present here the first work on ethnoastronomy dealing specifically with indigenous descendants in RN [see Jafelice et al. (2004) for detailed comments].

Mostly because of historical discrimination and persecution, RN indian descendants have not been used to accept their ethnical ancestry. The last national population census, however, shows that the number of people in RN who declared themselves “indians” evolved from 394 (in 1991) to 3,168 (in 2000) (for a total RN population of around 2.5 million inhabitants). That quick “growth” in fact reflects a change of mentality concerning people recognition of their ascendancy.

The work of surveying the indigenous descendants in the RN, aiming for FUNAI (a governmental entity dedicated to deal with indigenous affairs in Brazil) to attend their claiming for their recognition and rights, was initiated by one of us (ABS) more than twenty years ago. Such an initiative has led to the identification of at least four or five groups of indigenous descendants in the RN. That work received important contribution in the last years from the researches of one of us (JAC). Recently that discussion has been greatly improved thanks to the 2002 Fraternity Campaign promoted by the Natal Archdiocese.

The works of one of us (LCJ) are devoted to develop a holistic anthropological approach to education. Because of lack of space, see Jafelice (2002) for further discussions.

Objectives

- To survey speeches and practices of RN indian descendants related to celestial phenomena;
- To develop pedagogical procedures for application in a holistic anthropological approach for teacher training and scientific education in multicultural communities.

Methods

For the anthropological research we adopt the ethnographic method (i.e., interviews, empirical observation, etc.).

For the research on education we propose a holistic anthropological approach, in which subjects like anthropology, psychology and folklore inspire objectives, contents and teaching methodologies throughout any teachers course.

Results

Because intense indian persecutions in RN for centuries we hardly found indians who do recognize themselves as so. Contrary to first expectations, however, several basic aspects of pre-Colombian cultural habits seem to have resisted pressure and time.

We noticed that vivid local knowledge are still present today. They can be identified from procedures to find water resources and make weather prediction to autochthon expertises, like: obtaining adequate antidotes to endemic poisonous animals; taking advantage of local fauna and flora in order to prepare medicines, etc. (Cavignac 2004).

Most of those procedures are naturally connected to sky matters by those adopting them, like: the time to cross chickens and cocks according to the moon's phase; the measure of the night time by a given star, or the year's epoch by a given constellation, which usually are none of the traditional western constellations; etc.

Those and many other examples reveals knowledge used until today, which could not have been brought from Europe or Africa because of the unambiguous local character of their contents. This research indicates that in many important aspects for daily life in that region, the acculturation process seems to have had a much stronger influence from indigenous cultures onto the European culture than was usually assumed.

From the total of 201 people we interviewed from many places in the RN, 190 declared to be non-indians, and 11 clearly accept their indigenous ascendancy. From those, 71% of non-indians, and 82% of indians know about astronomy related issues and apply that knowledge in their daily life.

We conclude that within indian descendants the affinity with celestial phenomena is greater and sensibly more present in their quotidian talks compared to the rest of the population. Moreover, and perhaps with more profound implications, we notice that also for non-indians there is a relatively great affinity and inclusion of celestial phenomena in their daily lives.

Conclusions

As expected, such a greater indigenous influence involves knowledge which are more evident in areas where environmental and local autochthon wisdom could make the difference for survival, and require many centuries of human occupation in that region to be acquired.

Further researches will evaluate to what extent such a difference on knowledge and behaviour between indians and non-indians is evident for other cultural aspects and is exclusive of RN.

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Parallel Session 28: Discourse analysis contributions to PCST study

SCIENCE IN COURT. EXPERTS AND ADVISERS AS POST-ACADEMIC SCIENCE COMMUNICATORS

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Abstract

Scientific communication in court is particularly relevant for the understanding of the post-academic era of science.

For this study twelve narrative interviews with experts, lawyers, judges and journalists were collected.

The analysis revealed that they all communicate science in different ways and with different interlocutors, with varying expectations and results. Another peculiarity of scientific communication in the legal context is that there is a conflict of expectations between experts and jurists. While the expert's priority is the correct understanding and use of scientific truth, the legal party's priority is the acceptance or refusal of a scientific truth, to reconstruct the legal truth.

Key words: science communication in court, forensic science, narrative interviews.

Text

In the modern era, when techno-scientific ideas and products are increasingly present in everyone's lives, conflicts stemming from the intersection of science, technology and law are one of the main fields of redefinition for modern societies (Tallachini, 2001). Scientific truth and legal truth are being increasingly brought together to find effective solutions in legal proceedings (Josanoff, 1995; 2002). This research starts from the idea that in a multiple-centred system of science communication (Greco, 2002) scientific communication in court is particularly important for the understanding of the process of post-academic science communication (Ziman, 1998; Greco, 2002).

The problem of science communication in court is analogous to that of public science communication in general. Communicating science in court is often necessary for the carrying out of several legal proceedings, and sometimes for their solution. This kind of communication, however, faces specific problems due to the cultural, linguistic, methodological and epistemic difference between the legal and scientific parties of a proceeding. The court is thus a

post-academic context of science communication, with special characteristics that can influence society, making a specific study of this context necessary.

This research aims at:

- verifying whether and how the dynamics of science communication in court can be traced back to the problem of public science communication;
- underlining specific characteristics of science communication in court;
- proposing a sample of a "general table on science communication", to analyse every possible communication between the different parties of a legal proceeding.

A first attempt at finding an answer to these questions was field investigation. Ethnographic research on communication (Matera, 2000) was used to explore the places where science and law cooperate; experts, judges, lawyers and journalists were interviewed to discover the opinion of the main operators in this context, where the relationship between science and society is continuously changing.

Methods

Twelve narrative interviews (Atkinson, 1998) were collected for research and divided into two groups: experts and non-experts (such as lawyers, judges, journalists, etc.).

The narrative method (Atkinson, 1998) is based on non-structured "open" interviews. The result of this kind of interview is not a set of specific answers to a series of questions, but a "story" guiding the interviewer to enter the "other" world, the one in which science and the law meet, focusing on the experts, judges and lawyers and their modes of communication (Matera, 2002).

The communicative events (Duranti, 1999) between the researcher and the interviewees was important to approach experiences and cultural contexts, the understanding of which would have otherwise been difficult. Narratives present mainly personal experiences that no data, questionnaire, or news could express (Bruner, 1990).

Analysis of the interviews and conclusions

The following points emerged from an analysis of the interviews:

- 1) an analogy between the public communication of science in court and the proposal of the "Venice model", (Greco, 2002) based on the assumption that in the post-academic era public communication of science follows more than one direction to reach different audiences in different ways, not necessarily bound to the scientific community. Experts communicate science in different ways and with different interlocutors. But they are not the only ones speaking of science in court: judges, lawyers, speak of science among themselves with different expectations and results, not depending on the expert's mediation;
- 2) an analogy of the above model allowed for the creation of a general table identifying every possible "bridge" of scientific communication in court and perceptions of scientific communication by forensic protagonists;

3) an identification of some peculiarities of scientific communication in the legal context emerged. First of all, the conflict of experts` and jurists` expectations in the legal proceeding. While the expert`s priority is the correct understanding and use of scientific truth, the other legal parties have another starting point: the acceptance of a scientific truth, or its refusal, in order to reconstruct the “highest” truth in the legal context, that is the legal truth.

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Parallel Session 28: Discourse analysis contributions to PCST study

RADIOSCOPY OF THE PSYCHIATRIC SPEECH

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Key words: sociolect medical, psychiatrist, scientific terminology, popularization

Summary

Wimmer, in 1982, endeavoured to distinguish common language and language of speciality but the medical speech can common, be specialized if not both at the same time. The fact that a psychiatrist, in the exercise of his practice, address himself to various types of interlocutors, the fellow-members, the patients, the associations of patients *, it is led to adopt several types of speech. In a context external with the medical field, the informative speech, is centered on popularization thus simplified.

Thus, how to define "the medical speech clearly"? How to highlight the intention to communicate of a psychiatrist through written text of popularization? This work proposes to define the typology of the medical sociolect in the psychiatrists within the framework of popularization. By analyses of writings with intention to popularize, we show that the medical sociolect is not built according to a scientific terminology which dictates the bases of the medical terminology. It evolves, it is unstable and cannot escape from the influence from its successive users.

* regrouping of patients and family of patients around the same cause, like the fight against the same disease, generally formalized under the aegis of an association.

Introduction

The popularization of psychiatry as object of research

The popularization of psychiatry, which falls under medical popularization itself overlapping in the scientific popularization, so quite widespread today, is paradoxically not studied. Often regarded as simplified lacunar, approximate information, popularization in psychiatry settles as well as the scientific paper in the polemic which opposes the erudite knowledge to the profane knowledge. It becomes, in this context, a particularly sensitive study object.

The nearly simultaneous publication of two books in 2003 and of acts of a centenary congress make it possible to develop a comparative analysis of this same type of communication through two speeches, into psychiatric speciality and for public.

Need or required?

We distinguish already three types from the psychiatric speech : that of the psychiatrist, that of the patient, and that of the media and mediators. We will be interested here in the speech of the psychiatrist only. We base ourselves on the classification of Regent (1992) evoked by Christian Balliu (2001) and distinguish three types of psychiatric speech:

the esoteric intern speech, i.e. inherent with the microdomain, allowing the exchange and the discussion of information his even of the specialisation

(The esoteric external speech, which leaves the microdomain (general practitioners or doctors of other specialities). This speech will not be treated here.

the exoteric speech, primarily aiming at informing in a simple, clear way and concretes a public external with the psychiatric activity (patients, association of patients), but necessarily in contact with the latter by consultations, treatments or of a legitimate will of information.

Esoteric intern speech

The approach of the psychiatrist is informed methodically with tools and references explicit, adapted and verifiable. It is before a whole theoretical approach, methodological, or practical which to check a theory, develops a method, analyzes the operation of a phenomenon while making it comprehensible using intellectual diagrams of reference. The psychiatrist announces his theoretical and conceptual referents. The reproducibility of the comprehension of the "operation" of the phenomenon is an indisputable requirement of the scientificity. A "scientific" approach thus refers primarily to a scientific theory and concepts. The theory was elaborate starting from experimentation, of assumptions formulated and validation/invalidation of these assumptions on the phenomena.

The esoteric intern speech is built on statements in fact IE "any assertion which can be confirmed or refuted by the examination of evidence provided by the directions or their technological prolongation" (Stern 1979) - example of a statement in fact: "Since 1953, the teenagers suicide increased by 300 %". It is an assertion in connection with what is. That includes information which is true, those which are false and those whose truth or falseness is unspecified.

The esoteric intern speech results from an explanatory, persuasive and strategic language. Indeed, according to Balliu (2001), "a specialized text must, for reasons of syntactic and semantic articulation, to resort to a lexical and stylistic stock whose function is as well descriptive as explanatory and conjunctive"

A medical text comprises many terms of speciality but also good number of words borrowed from the usual vocabulary which taken, independently, does not predispose to think that one is in the presence of a medical text, of speciality which more is.

Esoteric extern speech

First of all, the psychiatric speech of popularization differs from a "narratologic" step or "esthetics" in that that the psychiatrist cannot be satisfied simply to bring back phenomena or to subject its own feelings to us. For a communication bound for large public, the step rests on the principle

that the reader inevitably does not have at his disposal knowledge necessary (Mucchielli (2000) talks about “intellectual equipment sufficient for a comprehension which exceeds the comprehension of the vulgum pecus”).

The exoteric speech, simple, informative, abounds in normative statements ie an assertion in which one evaluates or one prescribes - example of normative statement: "the divorce is a painful experiment". It is an assertion in connection with what should be. Such an assertion cannot be shown nor refuted by the examination of significant evidence because it connects an object and a value, ie a personal judgement. The following statements are normative statements. They are subjected to a regulation or value judgment.

Opposition common language / language of speciality

Several authors dissociate common language and language of speciality. According to Wimmer (1982), here how are distinguished scientific language and from speciality and common language:

Scientific language and of speciality	Common language
Precision	Indetermination
univocity	Ambiguity
Economy	Redundancy
Situational invariance	Situational multiplicity
Report with the matter / the object	Multiplicity set of themes/evaluation
Theoretical level	everyday life

With this inventory the opposition of Kocourek (1982) is added

Objectivity	Subjectivity
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"It [the language of speciality] aims at the ideal of intellectualization, i.e. the semantic precision, conceptual systematization, emotive neutrality, the formal and semantic economy; it thus tends [...] to neutralize or contain emotivity, subjectivity "Kocourek (1982).

Conclusion

The speech of the psychiatrist intrinsically to his field of specialization makes the use of the common language, the objective being for him to make itself comprehensible by its pars, a contrario when it intends to popularize, it does not hesitate to balance the speech of key concepts by the use of complex terms loans to the scientific semantic field of psychiatry. Thus, the distinction between language of speciality and language common, if expensive to several

authors, can then be regarded only as one Utopia "the biunivocity, dreams of any terminologist, remains a pious wish which will never be" (Balliu, 2001).

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Parallel Session 28: Discourse analysis contributions to PCST study

**THE RHETORIC OF BREAKTHROUGHS IN THE COMMUNICATION
OF BIOTECHNOSCIENCE**

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Abstract

The rhetoric of breakthroughs consists of representing science by its products, subsuming scientific processes to the teleological and cumulative pursuit of results, with an exclusive emphasis on outcomes that can be evaluated *ex post facto* as breakthroughs in applied science. This is tantamount to ignoring the cognitive pursuit of science as a process, disregarding the role of productive error in scientific decision-making processes, and identifying scientific ends to actual results, by excluding unanticipated and hazardous results, and, ultimately, risks. It must be acknowledged that biomedical technoscience is capable of providing means to an end, rather than producing results.

Key words: Rhetoric; Breakthroughs; Result evaluation

Text

The crisis of the linear model (AAVV, 1985) of the communication of science, permitted the emergence of an interaction model still open to discussion. An issue both frequently and superficially pointed concerns the representation of science and its following public perception according to its results rather than the process that lead to them. In effect, the euphoric and spectacular avowal of communication of science privileges (Nelkin, 1995; Semir, 1999) is not far from becoming a common-place, along with the display of its results to the detriment of the exposition of scientific process.

In the epicenter of the conceptual controversy in which the linear model has been questioned one can detect a assortment of demarcations between: what is science and what is not; literacy (of scientists) and illiteracy (of laymen) (Bauer, 1992); the domain of science and non-scientific public domain. The interaction model (Felt 2000b) between scientists, communicators and the publics emphasizes that interaction ought to be understood not as cooperation but rather as negotiation and, strictly, in the extent that those demarcations, far from remaining stable or stabilized by means of consensus, are rather permanently rebuilt, in a process of dissension and conflicts, befalling on those who hold the authority to discuss the very criteria of demarcation.

To this process of negotiation the henceforth classic concept of “boundary work” has been applied. It consists of a process concerning: when, how, and to what ends the boundaries of science are drawn and defended in natural settings often

distant from laboratories and professional journals (Gieryn, 1994). Boundary work is brought on by disputes over credibility, about who has the legitimate power to represent a sector of the universe, on what grounds, by what methods or virtues, and in which circumstances (Gieryn, 1999). Boundary work intensifies when people fight for, legitimize or defy the cognitive authority of science (Felt 2000a). In that sense, a rhetoric (Gross, 1996) of breakthroughs can easily be placed in the core of boundary work occurring in the communication of science.

Essentially, the rhetoric of the breakthroughs consists of:

- representing scientific activity by its products;
- subsuming scientific processes to ultimate and cumulative attainment of results;
- exclusively isolating as results those *a posteriori* assessed as successful accomplishments.

The above implicitly stands for:

- ignoring scientific activity as a process whilst proceeding through protocolar observance of *a priori* criteria of methodological rigor of investigation, advances in a non-linear, erratic and tentative way - that is akin to saying that it whitewashes both the intrinsic reversibility of all scientific knowledge and the rational reconstruction inherent to the pursuit of cognitive interests;
- canceling the role of productive error in decision-making and scientific choices, in such a way that success in the attainment of results can be ascribed to the rigor of methodological conception - which implies the necessary elimination of whatever surpasses the domains of rigidity delimited by method, and regarded as its spurious outgrowth rather than a mark of its limits of validity;
- producing an effect of positive censorship of science: either as producer of risks - to the extent that it encourages the illusion of the control of technoscientific risk - or as the provider of means, to the extent that it assimilates ends to results, defining in retrospect the former via the latest and exclusively identifying as results of scientific process those evaluated as positive, excluding haphazard, unexpected and adverse results.

Scientific process is defined by the means it employs and not by the results that it pursues or effectively reaches. This implies not at all the underestimation or disregarding of results, but it merely rearranges them within the discursive economy of the communication of science (Jeanneret, 1994). Thus, it becomes imperative to assert that biomedical technosciences are able to provide means rather than produce results, contrary to the rhetoric that hastens the illusion of the control of risk (Beck, 2000).

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Parallel Session 28: Discourse analysis contributions to PCST Study

SCIENCE IN THE PRESS: PROBLEMS AND POSSIBILITIES OF RECONTEXTUALIZATION

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Abstract

Recent studies on the public communication of science in the press have stressed not only the increase of science news but also the singularities of this kind of communication. The approach advocated in this presentation suggests that the analysis of the precise linguistic formulations in texts can provide insight into, and thus improve the practices of popularization. The analysis of our data shows that there are different types of recontextualization: on the one hand it means that journalists introduce an orientation in their discourse through the citation of different voices; on the other hand it means to relate scientific results to a social situation where the focus is on personal, economic, social and political consequences. Such science news is in general well understood by the readers. And finally, contextualization involves providing information about technical aspects, generally difficult to understand for ordinary people. These are the contents that have to be explained through various strategies, in order to bridge the epistemic gap between what the scientific community knows and what non experts know.

Keywords: discourse, popularization, newspapers, language, recontextualization citacion, explanation

Text

Discourse analysis focuses on the study of the *use* of language in *context* (Calsamiglia & Tusón, 1999). This approach is clearly distinct from the grammatical study of the structures and forms of language, which abstracts from context and speakers. In discursive linguistics the facts of language are observed and described within texts (understood as units of communicative interaction). The position, aims and involvement of writers with their own text and with their readers is inferred from what may be considered the conscious or unconscious choice of linguistic units at various levels; from the choice of semantic structures or syntactic constructions, the organization of the text and rhetorical resources, to their adaptation to communicative genres and channels, within the framework of the interaction between writer and reader.

Popularization discourse, a substantial component of science communication, constitutes itself on the basis of an asymmetric relationship: the communicating subject, who has access to the knowledge in the field of science, aims to interact with a non-expert audience which does not have such knowledge. With its popularizing practices the world of science (knowledge expressed and communicated within the scientific community) opens itself to the world of everyday experience and of social life. From a communicative point of view this is a particularly interesting case of knowledge transfer and

adaptation. During the last years, more and more studies in this perspective have aimed to describe the specificity of popularization discourse (Jacobi, 1999; Moirand, 1997; Ciapuscio, 2000; Myers, 2003). In this framework we make use of the concept of *recontextualization* in order to account of the linguistic-rhetorical treatment of scientific objects and authors in each communicative situation. In each case we encounter a distinct legitimacy as to the function and value of the linguistic units selected for communication. In this presentation we base ourselves on the results of a study of two widely reported cases in the written press (Calsamiglia & Cassany, 2001); Calsamiglia & Lopez Ferrero, 2003; Calsamiglia & Van Dijk, 2004): that of the “mad cow” disease (1996) and the announcement of the sequencing of the human genome (2000).

In the case of Bovine Spongiform Encephalopathy, we studied the way relevant discourses appeared in the press, e.g., the way journalists cite scientists and other social actors. Results show that scientists form a minority, far behind other social actors such as politicians and representatives of health and civil organizations. Moreover we studied in detail the structures of the passages preceding cited words, through which the author uses the voice of a social actor. It was observed that the writers present voices of different kinds and that their role is important because of (a) their choice of social actor, (b) their assignment of a communication verb, (c) their different identification of each social actor. Thus, the role of journalists shows through their introduction of citations with the veiled aim to steer the interpretation of their readers.

In the case of the sequencing of the genome, we focused our attention on another crucial aspect of science communication: explanatory resources. We observed that in the presentation of the sequencing of the human genome two contextualization modalities are activated; the most widely used relates scientific results with its consequences for people’s health, with economic and political perspectives, with ethical issues, with the ups and downs of the history of science and its actors, etc. Least used is the form of contextualization that we paid attention to: how is technical information explained to the readers in such a way that they understand the world of contemporary genetics.

The progress of these studies allows us to formulate some questions and thoughts about the role of popularization and in particular about its protagonists. If it can be shown that the role of the communicators is to put the advances of science into a socially relevant context, then their writing is not innocent and neutral, but rather contributes actively to the public presentation of new social representations (opinion, conceptualization). The selection of their quotations corresponds to a value scale; these citations can no longer be considered only as a way to avoid responsibilities or to enhance credibility, but also as a presentation of voices that argumentatively orient their own discourse.

As to the contextualization of scientific events, the new knowledge is didactically presented (through explanatory resources such as synonyms and metaphors) in a way that corresponds to cognitive functions that play a role in the introduction of new knowledge in relation to assumed previous knowledge. But the fact that this type of contextualization forms only a minor

part of contextualization when compared to sociopolitical contextualization suggests that knowledge remains very approximate. Are these inexact concepts necessary for the social circulation of new knowledge or do we have to intensify the explanatory endeavors?

Finally, my position with respect to the role of science communicators is that they must be *creative* and *involved* with the particular social context as well as *adapt* themselves subtly to each communicative situation. Their aim should be to achieve an approximate or basic technical knowledge which allows people to operate in social life in a piecemeal process of conceptual construction that cannot be realized at once.

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Parallel Session 28: Discourse analysis contributions to PCST study

SCIENCE POPULARIZATION PRACTICES FROM A LINGUISTIC POINT OF VIEW

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Abstract

Contrasting specialized discourse and popularizing discourse from a linguistic point of view, we show that the most relevant feature of popularizing discourse is *linguistic variation*. We illustrate these characteristics with the analysis of Internet forums and chats produced by Spanish language people affected by the HIV, by diet diseases or by the use of drugs. The questions that guide our research are: 1) which semantic characteristics of scientific concepts can be understood by the public?; and 2) which referring expressions (names) are the most adequate? The results show that: a) discourse linguistic approach provides useful tools to categorize and evaluate science popularization practices, and b) the study of these practices from a linguistic point of view is a necessary requirement to think about the way science is communicated to society and understood by people.

Keywords: discourse, linguistic variation, science popularization, Internet communication

Text

Theoretical framework and objectives

The discourse linguistic approach provides useful tools to categorize and evaluate science popularization practices. Contrasting specialized discourse and popularizing discourse from a linguistic point of view, we show that the most relevant feature of popularizing discourse is *linguistic variation*. The questions that are guiding our reflection are:

- 1) which semantic characteristics of *scientific concepts* can be understood by the public at large?; which *conceptual relations* are the most relevant and appropriate, and why? (Cassany, López & Martí 2000);
- 2) which *referring expressions* (names) are the most adequate in popularizing science? (Cassany & López 2002)

We illustrate these two points with the analysis of Internet forums and chats produced by Spanish language people affected by the HIV, the use of drugs or by diet diseases.

Popularizing science and Internet

Our aim is to characterise the use of science language by virtual Spanish communities related to the specialized medical fields mentioned. Three aspects define discourses within those communities: a) they show some typical features of each electronic techno-genre (chat, forum, web, etc.); b) they include a diversity of Spanish geographical, generational and social dialects; and c) they use an outstanding amount of terminology and specialized forms, coming from the corresponding scientific disciplines, used at popularized

contexts by non-expert people (chats) or addressed to non-expert people (forums), which acquire connotations and special meanings.

Science semantic and lexical variation at Internet

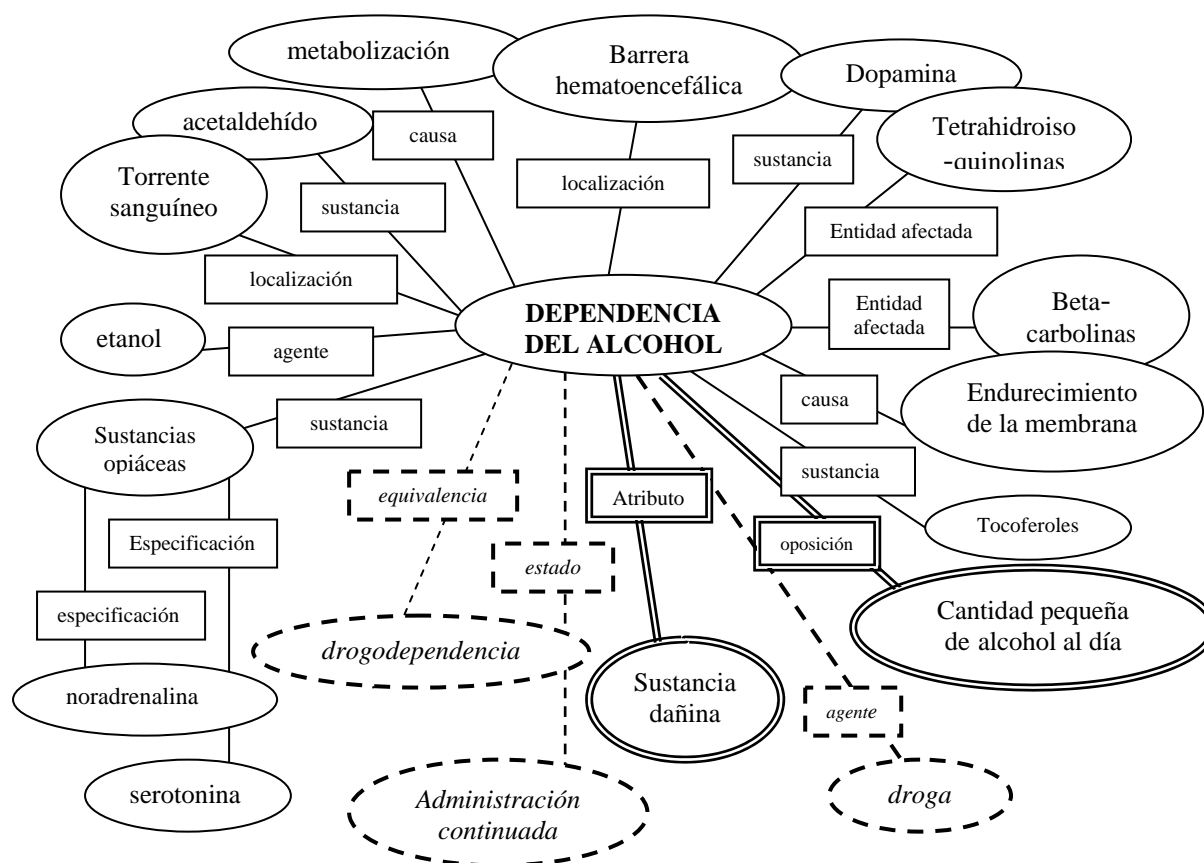
We analyse discourses at Internet from two perspectives:

- 1) The study of *conceptual networks* of terms employed in the messages. We compare the conceptual networks of the used terms with those of the same terms used within more specialized scientific discourses. This comparison allows us to establish the *meaning variation* that is going on at a term depending on the context (more or less general or specific) where it is used.
- 2) The description of the popularizing strategies (discursive, lexical and rhetorical) unfolded to *name* and *present* scientific concepts within messages. These analyses show the greater or lesser formality of discourse and the degree of shared knowledge among virtual communication participants.

Those two analyses are made on the discourses produced within the following web sites: egalia.com, interactua.net, foro-vih.org/preg, biopsicologia.net, foroanorexia.com, www.lasdrogas.info, foroanorexia.com, from 1999 to 2003, with 1082 messages and 140.770 words.

Semantic variation at conceptual networks

In the following diagram we show the changes that suffers the conceptual network of the term *alcohol dependence*. The central concept is the nucleus that establishes different links with other secondary concepts. With a straight line we stand out the links that are kept in the two domains (specialized and popularized), and we specify the type of established relation (according to De Beaugrande & Dressler 1981). With a discontinuous line we point to the conceptual links that disappears at the popularized text. Finally, with a double line we mark the new conceptual relations that are established at the popularized discourse in front of the specialized source (Cassany y López in press).



Naming variation

As for lexical issues, we have identified different types of popularization practices at Internet, depending on the status of scientific knowledge (new or shared):

- a) The contrast between two terms and the use of metalinguistic forms, which introduce *new* concepts within the communicative context:

A **diferencia** de otros fármacos de las mismas características, la mirtazapina tiene un efecto serotoninérgico más específico, con lo cual se evitan algunos efectos secundarios. [...] **Sin embargo**, la mirzapina tiene efecto antihistamínico, [...]

- b) Presupposition and naming proforms of very little semantic value, that involve *shared* information by participants:

Estoy muy bien, físicamente perfecto, en realidad nunca me he encontrado mal, me enteré de mi **“cosilla especial”** de forma totalmente casual.

- c) Creative uses to present scientific concepts, such as comparisons and metaphors, which combine the *new* information with the *shared* one, and the use of general and spontaneous terms of science origin:

No os voy a enumerar todos los padecimientos, ni quiero hablar de tratamientos, nauseas, y todas estas cargas que compartimos, sino de la carga que para mí fue más pesada durante algún tiempo: el silencio, el secreto.

Implications of the study

The study of science popularisation practices from a linguistic point of view is a necessary requirement to think about how scientific language is used by non expert people in their interaction. In this sense, it allows to evaluate the shared scientific knowledge and the way concepts from science are understood.

About the first question arised, our studies conclude that relations of *localization* and *cause* are the more frequent meaning variations introduced at scientific concepts to be understood by lay people. They are also new relations that place the concept, that is to say, contextualize it and stand out what causes it. They are conceptual relations which give answer to questions like who?, why? and where? The answers to these questions allow lay people to understand and give social relevance to scientific knowledge.

As for the second question is related, discursive (definitions, contrasts between two terms, for example), lexical (uses of specific terminology together with proforms) and rhetorical (metaphors, for instance) strategies are required by lay people to talk about science. In relation with these strategies, the main difference with specialized discourse lies in the use of some type of discursive (like constrast) and lexical (like proforms) practices in popularizing science, that are strange in specialized context.

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Parallel Session 28: Discourse analysis contributions to PCST study

**COSMOEDUCATION: THE EMERGING ALLIANCE OF ASTRONOMY
TEACHING AND TRANSPERSONAL PSYCHOLOGY**

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Abstract

In this work we are exploring the interface between astronomy teaching and transpersonal psychology in the educational context. Our working hypothesis is that astronomy contents, when correlated with transpersonal psychology practices, can be used as a cultural and academic vehicle to develop a cosmic identity. Our research universe was a group of students attending the Astronomy discipline in an undergraduate Geography course. We use the phenomenological method and applied active observation, interviews and psychotherapeutic practices. The results indicate that the subjective experience involving astronomical phenomena allows students to relate their inner and outer world and to expand their environmental perception.

Key Words: Education; Environment; Ethics.

Text

Introduction

Nowadays, although current space research has advanced with no precedents in the history of science, the majority of the people have no contact with the sky. It reflects the fragmentation crisis of modern life in different levels.

In science education the present crack between scientific knowledge and human experience in the western culture exposes such a crisis. Since humans started to understand reality from a Cartesian perspective, the Universe was perceived as a collection of objects separated from one another. The capitalism has reinforced this view and day-by-day we run away from ourselves.

According to Vajpeyi (1995), “the purpose of any education is somehow to return an individual to himself or herself and to enable him or her to see where she/he is placed in the system of relationships which constitutes life”. At this crucial point, however, is where the current educational system has failed.

Cosmoeducation aims to be a practical approach that would awake our ecological and cosmic awareness in order to rescue a holistic relationship between humans and cosmos. This concept is based on transpersonal psychology that studies the human being in its wholeness. This science can be defined as the scientific study of consciousness states especially the cosmic consciousness (Matos, 1991).

As stated in PCN (1999), through astronomy students are incited to understand the Universe and to project themselves to the great dimensions of space and time. Transcending the Earth limits they may achieve an amplified perspective about their existence in the cosmos.

We consider astronomy a privileged entrance way into the human-cosmos dialogue for any culture, in particular the western one. Our working hypothesis is that astronomy contents when correlated with transpersonal psychology practices can be used as a cultural and academic vehicle to develop a cosmic identity in our students.

Practices

During a semester, a group of students, enrolled in the Astronomy class of an undergraduate UFRN Geography course, attended to a series of meetings to experience psychotherapeutic techniques that were correlated with astronomical issues and adapted to that situation.

For instance, one practice was the “body expression of lunar eclipse”. First, the students had a warm up to render sensitive their sensory perception. Then, they followed the command of finding a comfortable place to stay and pay attention to their breathing. Following, students were asked to pay attention to emergent images and sensations that would come to them as a consequence of the words the instructor was going to say. They were asked also to express those emerging inner experiences through both sound and body movement. After that the instructor suddenly mentioned the words “lunar eclipse”. Afterwards they should occupy that space expressively and interacting with others to accomplish a collective composition.

According to their speeches during the afterward discussion we could infer that this practice stimulate the spontaneous emergence of archetypical elements from the collective unconsciousness in many of them and led the group to a better connection between inner and outer worlds.

Another example was the “representation of the Universe’s origin through a mandala”. It was proposed to the group to meditate about the images that come to their minds when listening the (then unexpected) words “Universe’s Origin”. As a next command the instructor asked them to represent such images by a free drawing called mandala (a centred symmetrical drawing usually found in oriental meditative practices and used in psychoterapy to express psychic contents). From that it was suggested to each one to look at her/his own drawing deeply and to penetrate into the figure as if it was a three-dimensional space.

We noticed that this exercise favoured the experience of an expanded state of mind to the majority and evoked deep reflections about the relationship between microcosmos and macrocosmos.

Final Comments

At the end of semester we could observe that the techniques used revealed to be an efficient tool to awake a cosmic consciousness in our students. In addition, the results reinforced the idea of astronomy teaching correlated with those practices as a valuable entrance to a cosmos and human existential relationship. (See Medeiros and Jafelice (2004) for further comments).

In the future we intend to apply this methodology of cosmoeducation in a course for primary school teachers dealing with 6 to 11 year old children. They are supposed to teach reading, writing, mathematics, language, science, and particularly traditional astronomy, all in an integrated way.

Finally, this is a proposal for the future in order to create alternatives for our students to expand their perception about the environment they live. From that we hope they start to build a new ethic body that could guide sustainable communities.

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