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Animal Experimentation in Higher Education: A Teaching Strategy Based on Prieto's Semiology

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Abstract: Didactic planning developed based on the semiology seems to favor the construction of scientific knowledge and the attribution of meanings by students, favoring the understanding of the content studied. This study discusses the first part of some research based on the messages and signs semiology proposed by Luis Jorge Prieto, bringing to light the conceptions of science professors and teachers to be on Animal Experimentation. The approach joined the dialogical/univocal discourse process to the multimodal representation reference to inform the Scientific Education learning process. The study was developed during a teacher development course, comprising fifteen attendees, university students and professors in the Biological Sciences area. Data was collected through open/close ended question questionnaires which were applied before and after the didactic intervention. The analysis of the semiotic act potential and the importance of analyzing messages and signs for the development of a meaningful teaching strategy that leads students to build up concepts on animal experimentation was carried out through the interaction of multimodal representation and dialogical/univocal discourse. The study also provided some insight on the human beings relationship with animal and non-human species.

Key words: animal experimentation, semiology, teaching sciences

1. Introduction

This study presents the results of the first part of some research related to animal experimentation in higher education, a controversial theme in the initial qualification of Biology teachers. The final analysis is supported by Semiology as the science of meaning. An analytical tool based on the Semiology assumptions might bring essential elements to underlie the teacher's teaching practice and help the discussion and understanding of scientific concepts which involve animal experimentation as a whole. The aim of this study is to propose didactic communication semiology to leverage the understanding of meanings in the classroom.

A discussion on the teaching strategy which was carried out with the university students and professors in the Biological Sciences teaching course, during the initial qualification and teaching development course on animal experimentation is presented.

The main aim was to observe the efficacy of a teaching strategy, planned in the light of the multimodal reference and analyzed employing some of the semiotic theories, mainly Luis Jorge Prieto's, which involves the

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interpretation of messages and signs to build meanings.

The research long tradition in the eminent field of conceptual change (DUIT, 2003) developed in the 80s and 90s posed as an objective to face the learners' previous conceptions replacing them with scientific ideas. However, its theoretical background towards this objective was proved limited when trying to promote significant improvements in this sense (Hubber et al., 2010). More recent studies have challenged and complemented the purely conceptual orientation of learning in this cognitive field. As a result, more emphasis has been given to the role of different forms and ways of representation employed in different languages, the importance of personal characteristics and contextual aspects to understand science concepts and to seek semiotic references (Laburú, Silva, 2011), so that the messages conveyed by the scientific signs can be better understood.

This project proposes to join the multimodal representation reference (PRAIN; WALDRIP, 2006) to the dynamics of dialogical and univocal discourse genres (Scott et al., 2006) as a teaching strategy for the learning of scientific concepts on animal experimentation. The ideia is to use elements of semiology to guide and inform the analysis of the efficacy of messages and signs (Prieto, 1973) sent by the professor to the student during the teaching strategy application.

The first part of the study presents the interlocutors' conceptions before and after the didactic intervention.

2. Theoretical Background

The approach based on controversial socio-scientific themes has become a necessity in the Biological teaching courses. In addition to aid the construction of scientific concepts by the students, the discussion of such controversial themes should leverage interactions in the classroom that seek the qualification towards ethics and citizenship (Mortimer & Santos, 2009; Charbel & Conrado, 2006; Krasilchik & Silva, 2013).

The experimentation with animals and non-humans is one of these controversial themes which have been addressed in scientific reports regarding Sciences teaching (Melgaço I. C, Meirelles R. & Castro H., 2011; Hummel E. & Randler C. 2012; Fossati P. & Pezza F., 2006).

Exaggerated certainty of one's own virtue, shameless bad taste and irresponsible activism are the main obstacles to the discussion of non-human animal theme in depth by all sectors of the society (Regan, 2006) and mainly in higher education. Regarding the animal experimentation, there is the perpetuation of an anthropocentric, speciesist and utilitarian model in most Brazilian universities (Greif, Trez, 2000). Teachers' education in universities is essential for the spread, construction and understanding of concepts among students. Utilitarian, speciesist, anthropocentric and even common sense concepts might be reproduced in schools as a consequence of a utilitarian, speciesist and anthropocentric qualification. Denis (2010) points out the educator's responsibility when transmitting knowledge and examples based on anthropocentrism. One of the reflexive practice tasks is the development of critical, unsatisfied and rebel curiosity (Freire, 2011). Therefore, it is highly relevant to question the educator's role as a mediator and motivator of this criticism. Not approaching the theme related to animal experimentation, not showing the backstage of exploitation based on scientific and ethical arguments is to ignore the symbiosis that exists between the cruel practices of animal exploration and the utilitarian and anthropocentric view of the world; it is to accept an industry of animal subjugation; it is to approach environmental education in a shallow way, ignoring the economic and social context in which it is inserted.

Brugger (2004), draws attention to the "environmental taming" that occurs in schools, once it excludes the moral dimension, reducing education to aspects merely technical (and not semantic) which contribute very little, if

so, to the qualification based on scientific education. Therefore, in the educative action there is no way to ignore ethical values in the discussion about the meaning of scientific knowledge, as they have a central role in the axiological system and determine motivations and models of behavior. Speciesism, a concept originally created by Richard Ryder in the 70s, can be considered a kind of prejudice rooted in the humankind and that appears explicitly in the justification given to the use of non-human animals in animal experimentation. The author defends that speciesism and racism are both kinds of prejudice based on appearance — if the other individual has a different aspect, then they are considered morally inadmissible. Racism is nowadays condemned in most social spheres and it seems simply logical that these people should extend their concern to other races and other species as well. Speciesism, racism and sexism disregard or underestimate the similarities between the prejudiced one and those who suffer prejudice, and these kinds of prejudice express selfish disregard of the others' suffering or interests.

Felipe (2007) suggests some reflection upon two kinds of speciesism, the elitist and the elective, or affective. The elitist speciesism considers the rational beings' interests always more relevant, just for the sake that the beings able to reason are members of the *Homo sapiens* species. While the elective or affective speciesism considers important to defend an animal interests, only when its appearance or kind of interaction provokes some empathy, kindness or compassion in the rational being. In the elective speciesism practice, the subject remains indifferent to the suffering of animals which are not part of their preferences (Felipe, 2007). Bravo (2008) studied the speciesist conceptions present in science school books. The books under study pointed to a speciesist conception as predominant in the school context.

Regarding animal experimentation, there is predominance of the common sense when the people are made to believe that they are dependent on the use of medicine, believing that their lives depend on the death of animals. Even knowing how to avoid cancer, diabetes and other degenerative diseases, people put their health in risk and later depend on the miracle of medicine to cure them. This cure is obtained through drugs, which most of the time only work in experimental animals (Greif, Trez, 2000).

Despite being one of the most profitable businesses in the world as it involves "products" such as animals, cages, contention devices, laboratory maintenance, animal food, research funds, the only ones who benefit from it are the ones who get financial profit from these industries. In Brazil, the vivisectionist research is one of the best funded (Greif, Trez, 2000). While many post-graduation students lack funding from public institutions, the institutions animal houses (facilities specially built to breed animals for experimentation) receive millionaire investment. However, few citizens are aware of the destination of their money in the institutions, or who is going to benefit from such research.

Welchman (2004), when approaching the theme of animal experimentation, defends the elaboration of ethical guidelines to animal experimentation. The author argues that "to meet their negative duties to prevent cruelty and minimize interference with animal welfare, pragmatists cannot be complacent about the laboratory practices permitted. Pragmatists should insist on the development of ethics review guidelines that extended the same protection to every species of animals considered for laboratory use and should support research into and the development to alternative techniques. But beyond these obvious points, pragmatists should do their best to retain the sense that the decision to use animal is tragic: always to be regretted and whenever possible avoided".

The semiotics as the science of meaning might bring essential elements to base the teachers' teaching practice and aid the students' construction of knowledge and meaning.

According to Postman and Weingartner (1971), teachers do not work with materials. They work with what is

available in their heads and what the students have in their heads. A semiological analysis of teaching communication might help to clarify the meanings shared by students and teachers aiming to understand the messages and signs produced throughout the lesson.

The intentionality, in this context, according to Buyssens (*apud* Santaella, Nöth, 2004) is the central criterion for the communication to take place. For this author, nobody reaches collaboration from others without some intention or premeditation. A semiotics of meaning allows the analysis of intentional and unintentional signs observed in the message producer.

The meaning of sign forms undergoes syntactic analysis, by considering the semantic values and by the induction of conditions and situations of their use (Fidalgo, Gradim, 1995). Mankind relation to the world is not direct, but mainly mediated by signs. The development of superior psychic functions is carried out through the internalization of sign systems culturally produced. The signs have a cognitive role while they work as a support to the memory and a powerful tool in the mediation of language and thought development, increasing our capability to act upon the world (Oliveira, 1993). Without the possibility of characteristic and permanent exterior signs as memory aid, substituting individual representations harder to distinguish and manage, there would not be any superior spiritual life or science (Husserl *apud* Fidalgo, 1998). Kubli (2005) says that individual consciousness is fed by signs and can only grow from them. To Peirce (*apud* Eco, 2003), every time we think we experiment some kind of feeling, image, conception or another representation that is a sign. According to him, the human being can only think through words or other external signs. And once each thought is a sign, then the human being is a sign. With this metaphor the author highlights the vital importance of a sign to the characterization of human beings and complements his position by stating that both the human beings and the words or any other external symbols are educated reciprocally, once each enrichment of human information involves — and is involved by — a corresponding enrichment of the word information (ECO, 1985). Moreover, Kubli (2005) remarks, even the meaning cannot be separated from the reign of signs exchanged among the members of a community and is not restricted to an individual mind. Therefore, when emotions, actions, reactions and other experiences are shown, these give the thought a body (Santaella, 2005), producing meanings. First, there is no complete meaning *per se* and it does not occur in an isolated way, but is always dependent on the different sources of information and the contextual mastering of experiences and social significance (Jaipal, 2010). Thus, a specific message the producer tries to transmit, needs to be favored among several and different messages, which is possible through the indication of a sign and the circumstances that draw the receiver's attention (Prieto, 1973). The circumstances are all the facts that must be known by the receiver when the semiotic act occurs. It is the whole context previously known by the receiver, prior to the emission of the semiotic act sign and which specifies the sign message among the several possibilities that carry the same sign. That is, the indication received from the sign, regarding the message, is not enough for the receiver to ascribe the sign a specific message, as the number of different messages admitted by a sign is basically infinite (Prieto, 1973).

According to Edwards and Mercer (1993), misunderstandings in the classroom are not only related to the content that is being taught or learnt (facts, theory, terms, procedures, etc.) These are the most trivial issues. The deepest misunderstandings might be those which are implicit in interpretation. In this context, the didactic communication is best understood as a process which requires increasing share of mental concepts through which several educational discourses become clear to those who use them.

As regards Prieto's semiology, it is important to highlight two points. The first is that the terms receiver and producer of messages and signs are widely used in his theory. But it is important to observe that in this study,

when transporting his theory of messages and signs to the scientific education, these terms do not have the meaning of vertical transmission of knowledge/content from the teacher to the students. As in Prieto's theory, the terms producer and receiver are used to point to the meaning of the message. And in Scientific education, sometimes the teacher, sometimes the students take turns in the role of producer and receiver of messages and signs. According to Prieto's (1966) terminology, good comprehension takes place when the messages between producer and receiver of the message are coincident. That is, in fact, the receiver understands exactly what the producer wanted him to comprehend. In this case, the semiotic act is considered successful. The author mentions two categories of semiotic act failure: one, named bad comprehension, that is, the message that the producer tries to transmit and the one the receiver links to the sign, are not the same and only message. The receiver understands something, but this is not what the producer wanted them to comprehend. The second failure regards the misunderstanding of the semiotic act: the receiver is unable to ascribe a particular message to the sign, that is, they do not comprehend what the producer wanted to say.

The second point regards the central objective of Prieto's theory which is the comprehension of messages and signs. It is relevant to emphasize that Prieto's semiology seeks to understand the concepts worked and not necessarily to convince the message receivers. It is in this sense that the author defends that saying is not necessarily convincing, and understanding is not necessarily accepting. When agreeing, the receiver admits that what the producer is trying to tell them is true and by obeying the receiver acts the way the producer intended to make them act. For the author, the semiotic act receiver might accept the influence that the producer tries to exert on them or not. A receiver who has understood what was said is not necessarily a receiver that accepts the influence that is tried on them. According to Prieto (1977), it is the saying of the producer and the understanding of the receiver, and not in the convincing and acceptance that communication and meaning are situated. Although a change in perspective of the students' views on animal experimentation has been evidenced throughout the discussion and analysis of this study, it is important to clarify that the methodology employed in this study was intentionally planned aiming to comprehend the concepts and not to convince the students.

3. Methodology

The sample comprised fifteen participants from which thirteen were students in the Biological Sciences teaching course, and two teachers of basic education with qualification in the same area, one of them with a Masters degree in Biomedical sciences. Data was collected through a questionnaire, applied before the instructional process (Appendix A). After the instructional process, the participants were asked to revise the questions in the first questionnaire and alter the points that had suffered any change of perspective in relation to scientific or ethical aspects. Individual interviews with the participants complemented the information. The students also provided a written report on the tasks. The main topics approached were: animal abolitionism and welfare; the four contemporary models of ethics; implications of animal experimentation in teaching and research; myths on animal experimentation; conscience objection and its practical results; vivisection laws; companies and institutions that carry out tests with no-human animals and some which do not, among others. Videos about animal experimentation, testimony of researches in favor and against the experimentation, textual production, alternate use of dialogic/univocal discourse, slides with image and theoretical background on the theme, and bibliographic reference for further information were employed. It is important to highlight that in this study the only analysis carried out was the one on the efficacy of the signs consciously planned produced by the professor throughout the

instructional process, while the non-conscious signs, according to Prieto's terminology, are considered object of further studies.

4. Analysis and Discussion

Ten out of the fifteen interviewees chose the Biological Sciences teaching course based on the possibility of carrying out laboratory experiments, which demonstrates the emphasis on a pragmatic conception of science. Four of them think that this possibility includes experiments with animal vivisection. When asked, before the intervention, on the reason for their option based on vivisection, all the answers were related to the conception that good scientists and science teachers can only be educated through vivisection. After the intervention, it was seen that all of them reported some urgency in revising their concepts about science based on vivisection. It is important to mention that the use of animals in teaching does not follow the same regulations as the research use. Therefore, the influence of the current hegemonic discourse and the common sense was noticed, which might be more associated to the students' curiosity regarding animal experimentation than to the learning to teach obtained from these practices.

Eight students reported that their graduation courses did not provide any information on Ethics or Animal rights throughout the instructional process. The remaining interviewees mentioned that, although there was reference to Ethics, it was related to the proper management of animals used. This reinforces the elective and elitist speciesism concept pointed at the beginning of this text. When asked to number in crescent order some animal groups according to the easiness to carry out experiments without students' emotional involvement, only two participants reported difficulties to elect one group as more important than another for this objective. Eight participants presented this order: arthropods, fish, amphibians, reptiles, birds, rats, dogs, cats, monkeys. This order is the same presented in traditional biology books on the evolution of species, which poses the question whether the emotional involvement of the participants is related to a supposedly pre-established hierarchical order. The others followed the same order, only exchanging the position between dogs, cats and monkeys, justifying that those are animals they have some interaction with and, therefore, they deserve the right to more empathy and protection. This reinforces Ryder's elective speciesism conceptions, described in the theoretical background of this study. All participants reported having taken part in more than five laboratory practices involving animals in their graduation courses. All reported that they have already worked with conserved animals, eight reported having worked with animals killed a bit before the lesson and seven mentioned having worked in experiments in which the animals were alive when the lesson started and were killed during the lesson. Ten out of the fifteen reported that the professors did not justify the use of these animals in their lessons. Nine reported that there was no significant learning of the content. Among the remaining ones, the following testimony called attention: "despite thinking I had learnt some content, I could have learnt much more with another method that did not use animals, as I was more worried with the animal suffering than with the content in itself" (interviewee 06). Eleven out of the fifteen interviewees are in favor of some substitute method to animal experimentation. The others believe that these experiments cannot be replaced. None of them knew the Conscience Objection Law. One declared having heard about it in one of the Bioethics lessons but could not explain it. All of them reported having felt emotionally disturbed during the experiments that involved vivisection. But nine believe this is a necessary evil in favor of the science. None of them agrees with the use of animals in religious rituals or entertainment such as circus or rodeos. But eleven stated being in favor of the use of animals in teaching and research. This data

reveals a permission to the science to produce knowledge through animal suffering, while their use in religious rituals and others was completely refused. The subjects listed by the participants as the ones that most use vivisection were, in this order: Human physiology (07), Zoology (04), Embryology (02), Immunology and Education Psychology (02).

After the instructional process, the participants were asked to revise their answers to the first questionnaire and later on alter the points that had suffered any change of perspective in relation to the scientific and ethical aspects. The main points altered by the participants and their remarks were:

the conception that practices involving animal experimentation are essential for the best education in the Biological sciences teaching course. Interviewee 1, who had agreed with that before the intervention, reported the following after the intervention:"*I am ashamed of having been in favor of animal experimentation for all these years. Many times we follow procedures automatically without really thinking that we are only reproducing some discourse or procedures that do not contribute to our education, but do contribute to the continuity of a system based on animal exploitation*". Interviewee 02 complemented:"*this course broadened my awareness on the efficacy of my learning, which I had never questioned before. I realized that I was much more driven by curiosity than the importance of my education*". Another strategy used was to expose the students to images and oral presentations revealing the backstage of laboratories and all the chain that supports vivisection, focusing on the most used kinds of experiments. After that, data was presented about the main myths involving animal experimentation. It was seen, during the instructional process, that the participants identified and established the objective of the messages and signs in each semiotic act provided by the professor. Interviewee 03 reported that "*the most interesting part of the course was to acquire a consistent theoretical background which I had never known of and realize how out of date our courses are in relation to this information*". This participant also reveals some knowledge acquired about the levels of experimentation:"*I learnt that a demonstration is not a practical lesson. Why is it necessary to repeat the same experiment hundreds of times using a large number of animals when the objectives and results achieved are already known?*"

Interviewee 05 reported that "this mini-course revealed a world that I had no knowledge of regarding the exploitation of animals in teaching and research. How much suffering and cruelty is embedded in the products we use and in the lessons we attend. We are not aware of the number of animals which are pointlessly sacrificed".

As regards the fact that most of the participants reported never having questioned science based on vivisection, the utterance provided by interviewee 08 is emblematic:"*this intervention overcame my expectations. I learnt several concepts that I had never seen before. The professor managed to expose those concepts very clearly. I realized that the ethics with animal experimentation goes beyond what is exposed in the university classroom. Certainly this course provided me with serious changes in my perception of these themes. I am thankful to have had the opportunity to realize that some situations can be different*". Interviewee 07, who works as a vivisectionist and gives rats and other animals anabolic agents and other drugs, reported that:"*I had never thought of some of the points that the professor addressed such as the diseases that affected mankind and were never predicted through tests in animals. I really have to revise my concepts and redirect my procedures*". Regarding the scale of importance given to animal groups previously mentioned in this text, all the participants, after the intervention, declared that taking the viewpoint of the Biocentric ethics animals cannot be classified as more or less important. It was seen that, even if ethical arguments are based on anthropocentric and speciesist concepts, the scientific arguments found and approached are enough to demonstrate the inefficacy of animals in teaching. After the instructional process, fourteen participants that had marked the option "religious rituals" when

asked about in which situations they disagreed with the use of animals, added the option "teaching" to the alternatives chosen.

According to the data collected, it can be said that there was no failure of the semiotic act, and that it was successful. That is, there was no disagreement between the messages and signs intended by the professor and received by the students. After the end of the instructional process, the target scientific message produced understanding of the content worked through the approach used by the professor. Taking into consideration as a circumstantial indication an environment that seemed to be unfavorable to the learning of the concepts intended by the professor, once most of the participants were vivisectionists and defended this practice in teaching, the suitable selection of multimodal representation in interaction with the dialogic/univocal discourse production, based on scientific assumptions, revealed an efficient strategy to the conceptual change, even if in a preliminary analysis.

5. Final Consideration

Through this didactic intervention, it was seen that the messages and signs previously planned by the professor can contribute to the students' understanding of concepts under study and moreover, to the broadening of students' previous conceptions related to the main concepts of animal experimentation. Bringing this theme to discussion in higher education might result in the problematization of the exploration and animal suffering issue and other aspects regarding animal experimentation in teaching, providing students with the chance to make their own decisions. The arguments presented in this study, through the teaching strategy based on messages and signs, demonstrated to have enough teaching force to change the current situation of a curriculum based on the utilitarian ethics model, consequently anthropocentric and speciesist. Further research is suggested on the origin of these hegemonic conceptions and actions within a civilization that grew believing in the naturalization of animal use, and consequent disregard of animal rights or the understanding of their use as a cultural asset.

Although this intervention was a simulation to provide the refining of some aspects regarding the reapplication of this teaching strategy to other contexts, it was possible to realize that the conscious planning of messages and signs produced by the professor, mediated by multimodal representation served as a didactic provocation to favor the understanding of concepts worked in the teaching-learning process related to the implications of animal experimentation in the Scientific Education.

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