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Contributions of the History and Philosophy of Science and Methodology of Problematization to the Public Health Policies teaching and their connection with the Environment

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SUMMARY

This paper aims to report and analyze a pedagogical practice developed for Public Health Policies teaching in a course held at the Federal University of Lavras, in the first semester of 2018. For the development of this paper, a class was created and taught in a Public Health Policies teaching course based on the History and Philosophy of Science and Problem-solving Methodology, seeking to understand how these pedagogical strategies contribute to the teaching of this theme and its connection with the environment. At the end of the class, students were asked to evaluate the practice, pointing out the strengths and points to be improved. These feedbacks were organized and analyzed qualitatively through the Content Analysis and, later, were discussed. The results of the analyzes indicate that Environmental Education cannot be conservative of social conditions, but rather present the connection between man and nature, highlighting the link between the exploration of nature and the production of goods. In addition, the History and Philosophy of Science, starting with questions about the reality of students, can enhance the teaching-learning process, since it can avoid fragmentation of knowledge, allowing an approximation of students to scientific knowledge and its social use.

KEYWORDS: History and Philosophy of Science and Methodology of Problematization. Health and Environment. Critical Environmental Education.

INTRODUCTION

In a context in which people are bombarded by information, including being victims of fake news, education must assume a bias towards citizenship and critical thinking. According to Candau (1999), educating for citizenship must be based on a social-political action, which is collective. Based on this premise, educating for citizenship is educating for democracy, since this education transcends the individual needs of the subjects and incorporates an ethical and moral concern - in the sense of providing reflections on how to act to make life worth living - in the lives of these people. In this way, to form subjects who reflect on the issues that involve the society where they live, understanding this environment becomes essential. In this perspective, is interesting that the understanding of the environment starts from an environmental perception that considers the interactions between man and nature, and how this relationship is dictated primarily by the current consumption model in society (PACHECO; SILVA, 2007). Amorim Filho, Kohler, and Barroso (2003) corroborate this statement when they say that after the industrial revolution, and uncontrolled exploitation of natural resources has been intensifying, given that a monopolistic acceleration of the economic production model was propitiated (AMORIM FILHO; KOHLER; BARROSO, 2003).

In this perspective, according to Buarque (1990), there is a need for a change of values regarding the environmental issue, understanding that nature, not yet transformed, cannot be seen as the only scenario for environmental action (SERRES, 1991). Furthermore, an analysis aimed at understanding the environment must be based on the understanding that there is a link between natural phenomena and processes and the historical-social processes of capitalist production (LEFF, 1986). According to Meyer (1991), the first reading of the human being, even before literacy, is the reading of the environment, and this reading is full of perceptions that are meant by the observer according to his social relations. Meyer (1991, p. 42) complements this saying that

> the environment is in a continuous and dynamic process of transformation, resulting from natural phenomena and human actions. A pedagogical proposal for environmental education has to consider these changes, considering that social groups appropriate natural resources in different ways, depending on historical, economic, and cultural factors. The readings and re-readings that we make of the environment are inserted in this context in different ways, is marked by the production process and by the world of work, play, imagination, beliefs, and rituals.

It is in this sense that understanding the environment in its relations with society gains meaning because at every moment we are acting on nature and transforming it according to the consumption pattern of the society in which we are inserted and the production model instilled in it. The environmental issue reinforced in schools starts from a conception of the environment related to living beings, the waste produced by humans, and individualistic actions of sustainability (CUNHA E LEITE, 2009). According to Meyer (1991), this view makes the environment unnoticed in its relations, because it is a static and fragmented view, thus, "the ability to observe, record and analyze is asleep and the environmental reality becomes naturalized, reified, instead of being analyzed as a socially constructed reality (MEYER, 1991, p. 43).

In this follow-up, to provide a wider vision of the environment, there are multiple aspects to be observed and considered, such as:

> sanitation (water, sewage, and garbage), electrical energy, transportation, types of housing and construction materials, flora and fauna, water and mineral resources, industry and commerce, the social organization of labor, health services, historical, artistic, and architectural heritage, leisure areas, agriculture, cattle raising, eating habits and beliefs. (MEYER, 1991, p. 43-44).

From this, it is clear the relationship between health and environmental issues, and dealing with these issues during classes from this perspective can enhance the teaching and learning process, since treating the space as a health space can allow subsidies for collective environmental actions to be thought. Thus, according to Edmundo et al. (2008), to approach the school as a health space, we start from the idea that being healthy is to have the possibility to evaluate its potentialities and to start from what one already has to build a better scenario. Being healthy does not mean being above day-to-day problems, but being able to problematize a situation by perceiving how the environment acts on it. Nothing is unattached, de-contextualized, so the school space, understood as healthy, must be considered within a larger context: the community where it is inserted and the society that structures it.

In this sense, considering that biology is important to human beings, both individually and socially, it is important to emphasize that its teaching should be based on students' prior knowledge, so that the construction of scientific knowledge acts in consonance with the reality in which students are inserted. In this context, the Problematization Methodology, outlined by Bordenave and Pereira (1982) is an alternative, since this pedagogical strategy can be used in situations where the themes are related to life in society (BERBEL, 1998). In this scheme, five steps are developed from the reality in which we are inserted: Observation of Reality; Key Points; Theorization; Solution Hypotheses and Application to Reality. The first stage is the

observation of the students' reality and social context, where the educator takes a critical look at the students' reality, looking for ways to contextualize the theme to be taught with their social life (BERBEL, 1998).

After observing the students' reality, the educator starts to have a repertoire that allows the raising of questions that will lead to reflection by the students. After this stage comes Theorization, where the investigation of the problem occurs, the students organize themselves and discuss to seek the information they need about the problem. Afterward, the students must think about possible solutions to the problem and, finally, comes the stage of Application to reality, which transcends the class. According to Berbel (1996, p. 8-9), this stage is very important because "this practice implies the student's commitment to his environment."

Besides the Problematization Methodology, another alternative to traditional teaching is the History and Philosophy of Science as a pedagogical strategy. According to Ferreira and Ferreira (2010), when the teacher approaches the History of Science, he/she builds a greater amount of knowledge to the students in an interdisciplinary way, having a motivating and formative character, providing conditions for the deepening of the contents. In this sense, the contextualization of the themes based on the History and Philosophy of Science in basic education has relevance in improving the conceptions of students and teachers, especially for the new methodologies used in the approach of the themes (OKI; MORADILLO, 2008).

When the teachers decide to work with the History and Philosophy of Science, one must be careful that a distorted and ahistorical view of Science is not presented to the students. A possible way to do this is to show students that scientific making is not an isolated activity, but an activity done by a collective of researchers who formulate their style of thinking from their social relations (FLECK, 2010). Therefore, scientific work is not an isolated activity, but the social consequence of a set of actions. According to Fleck (2010), individual actions are not minimized, however, isolated individuals cannot be considered as bearers and builders of science, because science is made collectively with society. Thus, there are factors external to science that motivate scientific endeavor, the social organization, and dominant interests govern the direction of resources and how this research will take place. From this, by introducing students to the fact that scientific knowledge is made collectively and not by isolated geniuses, we can motivate them to pursue a scientific career, since they may feel capable of being scientists.

In this context, the research question to be investigated in this paper is: How does the History and Philosophy of Science and the Methodology of Problematization contribute to the teaching of Public Health Policies and their relation to the Environment?'

OBJECTIVE

This paper aims to report and analyze the development of a pedagogical practice built to teach Public Health Policies in the Biology Teaching Methodology course offered to the Biological Sciences Undergraduate course at the Federal University of Lavras, *Minas Gerais*.

METHODOLOGY

The subject of *Teaching Methodology in Biology* proposes the construction of a didactic sequence based on alternative teaching methodologies. This paper analyzes one lesson of the didactic sequence, being Policies for Public Health, developed based on the thematic axis Human Being and Health of the National Curriculum Parameters (BRAZIL, 1998).

For the development of this work, a pedagogical practice for teaching Public Health Policies based on the Methodology of Problematization and the History and Philosophy of Science was built, taught, and, after that, analyzed. This practice was developed during the first semester of 2018. Thus, we used the participant-observation, in which the researcher is inserted in the process in which he is observing and, from this, obtains data that is born from the interaction between the researcher and other participants (CHIZZOTTI, 2019). The class was recorded in a logbook and it will be reported here. At the end of the lesson, students were asked to evaluate the class in writing, pointing out strengths and things to be improved. These evaluations were analyzed qualitatively.

Analysis Methodology

To analyze the evaluations, it was used ontent Analysis, which consists of systematic procedures that aim to describe the content of messages that carry meanings considered important to the researcher (BARDIN, 2011). The students' evaluations were organized according to the similarity between them, constituting thematic categories; this process is called Thematic Categorization (CÂMARA, 2013). Subsequently, these categories were discussed. In all, 14 students participated.

RESULTS

Class description

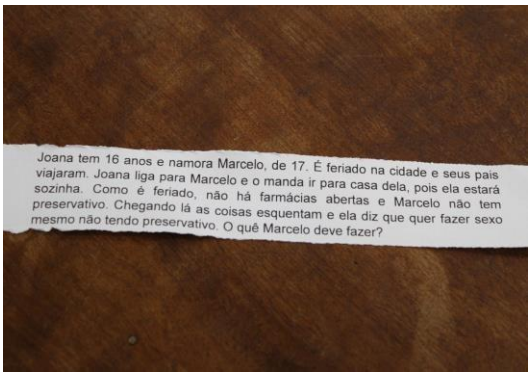
This class was organized in three moments: presentation of a problematizing dilemma and its discussion; historical-philosophical contextualization of Public Health Policies in Brazil and the World; discussion about the main problems faced by the Unified Health System[1]. The problematizing dilemma consists of a story related to the students' reality in which a decision must be made. This is the dilemma: "Joana is sixteen years old and dating Marcelo, who is seventeen. It's a holiday in town and her parents are away. Joana calls Marcelo and tells him to go to her house. Since it is a holiday, there are no pharmacies open and Marcelo has no condoms. When they get their things to heat up and she says that she wants to have sex even though she doesn't have a condom. What should Marcelo do?''

[1] The *Unified Health System* is the Brazilian Health System.

First moment: presentation of the dilemma

In the classroom where the class was developed, there is a large table that holds all the students. Then, as manipulative material, the students were given a printed sheet of paper containing the dilemma to be discussed (as shown in Figure 1). Once all the students had the dilemma in hand, they read and discussed it.

Figure 1. proposed dilemma



Source: PERSONAL COLLECTION, 2020.

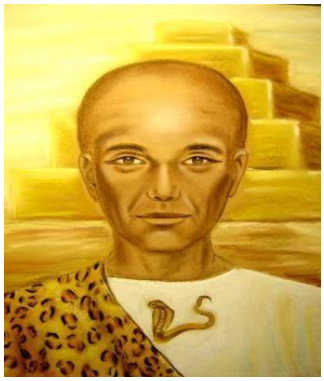
The students themselves raised important questions, pointing out the use of condoms as protection against pregnancy and sexually transmitted infections. At this point, it was possible to realize the importance of starting the class with this problematization, because there came a time when students were no longer responding to the teacher, but to their classmates, thus putting forward their ideas and their knowledge regarding the topic discussed. During the conversation, the students were asked about how the situation of the dilemma was seen in the last century, whether there were discussions about the use of condoms and, knowing that the modern condom has existed since the middle of the 19th century, what was the reason why people of previous generations had so many children. Although the condom, as we know it, has existed since the 19th century, several issues have hindered its use. The first is religious, contraceptive methods are not well regarded by the Church and, in a mostly religious country, the use of these methods ended up being limited. In addition, for a long time, contraceptive methods were not accepted by people, associating them with promiscuity. By discussing these historical-social issues, it was possible to enter the second moment of the class, the historical-philosophical contextualization of Police for Public Health.

Second moment: historical-philosophical and social contextualization of Police for Public Health

In this moment of the class, two printed images were presented, one showing the face of Imhotep (as shown in figure 2), the first to leave records about medicine in history; and

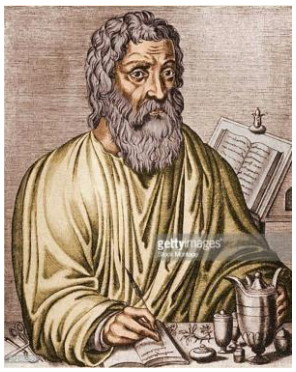
Hippocrates (as shown in figure 3), considered the Father of Medicine even though he was born 3160 years after Imhotep.

Figure 2. Imhotep.



Source: GOOGLE IMAGES, 2020.

Figure 3. Hipócrates.



Source: GOOGLE IMAGES, 2020.

Hippocrates is considered the father of medicine, however, it was pointed out that there was a collective of philosophers about nature and medicine, the Hippocratics. A mental exercise was done, and an imaginary story was created: everyone was in Ancient Greece and would do the same investigation that the Hippocratics (collective of thought) did when they discovered an important point about people's health. Two scenarios were established, big cities and rural life. It was stated that people who lived in the big cities got sicker than people who lived in the countryside. From this, the students pointed out that civilization determines people's health. It was then noted that contact between people made them more likely to get sick, so in the city, people got sicker, since contact between individuals in a large population is much greater than in the countryside, where the population is much smaller. After this, the professor brought up the meaning of the word "health", which comes from the Latin *salutis* and means "conservation of life". Thus, the term ''Public Health Policies'' appeared, being a set of practices carried out to conserve life in society.

It was also discussed that before Hippocrates, health and illness were seen as a religious practice. At this point, the students were asked if they had ever been "blessed"[2] as children. Many answered yes and, from that, the relationship between beliefs and conceptions of nature was discussed, highlighting that despite the role of beliefs in people's lives, health and disease go beyond a divine punishment or gift, they are aspects of existence determined by the way of life we have, how we collectively relate to the environment, how we consume and how we produce. Since the more degraded the environment, the greater the imbalance and the greater the chance of collective disease. Therefore, for changes to be effective, we need to understand that the environment is not only the green of nature but also our cities and the way we deal with our consumption and our production of goods.

Then, the image of Imhotep was brought up, with the following question: "Why is Hippocrates considered the father of medicine if Imhotep had already written about it more than a thousand years before? At this point, Eurocentrism was discussed, evidencing that

[2] Common practice in Brazil, where people look for spiritual healers to get help with health problems.

Imhotep is Egyptian (born in a country located in the African continent). From this, social issues were discussed, and it became clear that social problems, in most cases, are multidetermined and have a great relationship with our historical and social construction.

Continuing the class, we discussed the discovery of Brazil through the question: "Before the arrival of the Portuguese, did the natives have policies for public health? One student stated that the indigenous people drank medicinal teas and washed, and all these were practices carried out to preserve life. Then there was a discussion about what are health practices and what are public health policies. It was explained that practices refer to individual-level measures like washing hands before eating and boiling water before drinking; and policies are measures at a broader level, where they are the set of these practices applied to society, of governmental responsibility

Third moment: Problems of the *Unified Health System*

Finally, we move forward a few more centuries of discussion, getting to the 20th century, in the implementation of the Unified Health System in Brazil and the conception of health according to the World Health Organization (WHO). It was brought up that, according to the WHO, a healthy individual has a physical-mental-political-social well-being. At this point, a reflection on the social conditions of the Brazilian population was suggested, questioning whether Brazilian citizens are healthy. The students answered that Brazilians are at least 50% less healthy than other places because they even have physical and mental well-being, but the political and social ones are missing since we are afraid to go out on the streets and there is a lot of corruption in the country. Still, the absence or ineffectiveness of public actions in the country was highlighted, where a large part of the population still does not have access to basic sanitation or even drinking water, being much more susceptible to diseases. One student pointed out that the problems are a consequence of a bad political administration, and all these points that determine a healthy being are governed by the political welfare because if we have this welfare, we will not have social problems and as a consequence, we will not have physical and mental problems either. Another point raised was health as a form of aesthetics. For example, today we don't brush our teeth to be healthy, but to maintain a beautiful smile. The students said that this is fine, as long as people keep doing things that make them healthy. Then the teacher used the idea of a philosopher to explain this question, the philosopher in question was Immanuel Kant (1724-1804), who states that it does not matter what you do, what is important is the reason behind what you do. It was pointed out that if a person does not need to brush his teeth to look good, he will not brush his teeth, and that is bad for him, so the reasons why one takes an action must be consistent with the action taken, and from this, it was explained that we should brush our teeth because it is a matter of health and not aesthetics.

Then, a slide was projected containing the biggest problems faced by Brazilian health, these problems are unqualified professionals; long waiting times; poor financial management; a high number of deaths. Each one of these problems was discussed, always making a parallel with the students' reality, asking if they have ever waited in line at hospitals for a long time, if they have ever had difficulties scheduling exams in the public health system, etc. It was then concluded, through problematizations mediated by the teacher, that all these problems faced

by *Unified Health* System are a consequence of the political and social malaise, that the high number of deaths is a reflection of unqualified professionals, long waiting times, and poor financial management.

At the end of the practice, the students were asked to evaluate the strong points and the points to be improved in the class. These statements were analyzed and organized according to their similarities.

Analysis of the evaluations and Discussion

From the analysis of the reports, three categories were created: 'A new conception of the environment, 'Historical and philosophical contextualization of science' and 'Interaction between teacher-student and problematizations'. Below is the table with the categories, their description and frequency, and then the discussion of each one of them. To preserve the identity of the student participants, they will be referred to as S followed by a sequential number (S1, S2, S3).

Table 1. Categories, description e frequence.

Categories	Description	Frequency
A new conception of the environment	This category groups the students' speeches that highlight the relationship between the environment and society, going beyond the concept of considering only living beings and the pollution of nature.	9
Historical and Philosophical contextualization of Science	Here are the speeches that highlight the importance of treating scientific concepts from their historical-philosophical context	7
Interaction between teacher-student and problematizations	In this category are the speeches about the interaction between teacher and student, highlighting the language of the teacher and his attitude in the classroom, as well as the problematization of everyday issues as aspects that reduce the distance between the educator and the students.	7

Source: AUTHORS, 2020.

A new conception of Environment

In this first category, we include speeches about the conception of environment approached in the class by the students after the development of the class, as we can see in the speeches of students S1 and S2:

> ***S1*** *- Very interesting how you brought elements about the environment, showing that the environment goes beyond the bush and the animals' environments idea that the environment is also the place we are and that our action needs to be collective to have an effect is very interesting. Congratulations! I liked the historical context too.*

> ***S2*** *- The destruction of nature goes beyond not using plastic, it is also related to health and government actions, as it was brought clearly and interactively in the class. Congratulations.*

Following the current production model, which aims at a profit, Environmental Education has been brought in schools only as a sporadic cross-cutting theme or individualistic and technicist actions. According to Brugger (2004), this view does not result in a quality environmental education but rather shows immediate results that are not maintained, assuming the role of training students for sustainable actions without effective reflection on this issue. Cunha and Leite (2009) say that this traditional practice reduces environmental problems to pollution, exacerbated exploitation of natural resources, and, as a solution, each one should save water when bathing and recycling. However, this perspective ignores social relations and how social organization influences the exploitation of nature, preventing a more comprehensive perspective (CUNHA; LEITE, 2009).

This perspective tends to seek solutions to problems by looking directly at the problem, configuring itself as a mechanism for reproducing reality as it is. This conception "preserves the movement of the constitution of reality according to the dominant interests - the logic of capital" (GUIMARÃES, 2004, p. 26). Because of this, the author calls this conception Conservative Environmental Education. Still according to Guimarães (2004, p. 26),

> this is an understanding of the world that has difficulty thinking of them together, the whole, the complex totality. Focused on the part, it sees the world as broken, fragmented, disjointed. By privileging one of these parts, the human being, over the others, nature, it establishes a hierarchical difference that builds the logic of domination. Through the prevalence of the part in understanding and acting on the world, characteristics of modern life that are individual and social emerge: sectarianism, individualism, exacerbated competition, inequality, and dispossession, loneliness, violence.

From this perspective, a new conception of the world becomes important, one that does not see it in a fragmented way, but one that understands that the social relations of production and consumption of material goods are the foundation of what determines environmental problems and, to solve these problems, individualistic practices must be overcome, seeking the construction of collective actions for intervention on these socio-environmental problems; this conception is understood as Critical Environmental Education (GUIMARÃES, 2004).

Thus, by relating Public Health Policies to the environment, seeking to understand it as a social issue, it shows students that socio-environmental problems are not only determined by pollution, but also by what motivates environmental degradation. In this sense, by presenting this perspective to students, an individualistic and guilt-based view of the environmental issue is overcome by pointing out that this problem is a reflection of social relations of domination. The social collective is ideologically forced to buy the latest technologies and, if this ideological domination does not work, the technologies are already made with expiration dates, so that the

consumption pattern is maintained, reproduced, and legitimized. Therefore, it is in this context that a pedagogical proposal that proposes this kind of discussion gains significance.

Historical and Philosophical Contextualization of Science

In this category are the speeches that highlight the historical-philosophical contextualization of science as significant in the teaching and learning process, as highlighted by S3 and S4:

> ***S3*** *- Very interesting class, bringing history into the context is very important, because it points out that everything has its time and space, moreover, based on the history of Public Health, you were able to discuss social issues that are still present in society today.*
>
> ***S4*** *- Cool, history is fantastic, it allows very current discussions.*

The use of History and Philosophy of Science as an alternative for the improvement of the teaching-learning process of topics in Natural Sciences is meaningful, since "learning about science must be accompanied by learning about science (or the nature of science)" (EL-HANI, 2006, p. 3). In line with this, Moura (2014) states that historiographical approaches to science provide conditions for the genesis and development of scientific facts to be discussed, as well as the existence of the factors external to science - such as the political-social context - influence the organization of this entity. In this sense, science education has the goal of providing subsidies for students to understand the world from a scientific point of view (MOREIRA, 2004). For this goal to be achieved, it is necessary to understand what scientific knowledge is and what the proposals for the demarcation of science have been built throughout history. It is in this context that the Philosophy of Science gains significance since it is an important tool to observe scientific concepts in a transcendent way to the knowledge itself, being able to guide discussions about how this knowledge was born, developed, and organized. However, for these discussions to be brought to depth, the History and Philosophy of Science also become relevant in the training of teachers (GIL PÉREZ, 1998).

However, there are some obstacles regarding this approach, such as the lack of philosophical formation itself in the graduation courses in Natural Sciences, teachers' lack of interest and, due to the lack of formation or, when they are interested, they work Science in a linear and distorted way, pointing out that the great discoveries are made by people who are short of life in society (MARTINS, 2007). El Hani (2006) agrees when he states that the formation of teachers is limited to the theoretical and practical aspects of the scientific contents, in a dichotomous way, without providing historical-philosophical references necessary to mobilize the epistemology of Science in the constructions of the classes. Thus, we highlight the importance of the History and Philosophy of Science also in the formation of teachers, to form professionals capable of developing pedagogical practices that allow a dialogue between Science and Society, presenting the very diversity of scientific thought and the demarcation of Science facing the current anti-scientific wave that society has been facing in these last years.

Interaction between teacher-student and problematization

In this category are the statements about the interaction between teacher and student, highlighting the language of the teacher and his attitude in the classroom, as well as the problematizations of everyday issues as aspects that reduce the distance between the educator and the students. Below are two statements that support this category:

> ***S5*** *- Your language, posture, and questions make us feel closer and more comfortable to participate, so the class doesn't get boring and tiresome.*
>
> ***S6*** *- Very good class, congratulations. It was interesting how, based on everyday issues, such as the use of condoms, the class could culminate in a discussion about public health and the environment.*

A class does not consist only in the explanation of scientific content, the relationships between the subjects present in the educational environment are equally important since the formation of who we are is born from the dialogue, from the interaction with others, and not in the pure relationship with knowledge (ARROYO, 2001). Thus, the exchange of experiences and the sharing of knowledge provide a space for mutual formation, where the teacher plays the role of both trainer and trainee. The educator should be a mediator of scientific knowledge, not an applicator of it. In this sense, it is important that he creates a bond with the students and shows them that whenever they need the teacher to help them, in this way a relationship of trust is created and the distance between the teacher and the student decreases. Therefore, the relationship between teacher and student should be one of cooperation, respect, and growth, not an imposition. The student should be considered active in the process of knowledge construction, and the interactions built are fundamental in this process.

Smolka and Góes (1995) when talking about the idea of mediation, highlight it as a subject-subject-object relationship, that is, they point out that it is through others that the individual establishes relationships with the object of knowledge. The construction of knowledge and its appropriation is based on the relationship with the other, so the relationship between teacher and student must be close, the student needs to see that the teacher hears and understands him/her. Klein (1996) argues that the object of knowledge does not exist outside human relationships and that to reach the object, the subject must create and maintain a connection with other individuals who are in the process of building knowledge. From this, these relationships may be established from problematizations that bring the reality of the students closer to the knowledge that is being worked on in the classroom. In this way, the object of knowledge is identified from its social use, in the materiality of relationships, and how these determine the organization of the society in which we are inserted. Therefore, the problematizations can allow an analysis of social problems to occur, providing conditions for students to observe these problems from a broader perspective and, based on this, take more effective positions than mere individual actions.

CONCLUDING REMARKS

Environmental education cannot limit itself to reproducing and legitimizing the relations of domination present in society. Interestingly, this conservative role is overcome to provide a broader understanding of the problems surrounding the environmental issue, understanding that these problems are multidetermined and individualistic actions that start from a blame-based conception are not effective. A non-fragmented view of the world must be considered during environmental practices, enabling the perception of the relationship between consumption and production patterns of goods and the exploitation of natural resources, contributing to the formation of critical subjects and citizens. It is worth mentioning the importance of relating social issues - such as Public Health Policies - to environmental issues, since they are not unrelated, and effective actions to transform this reality are better marked when there is a broader view of existing problems.

Finally, we understand that the use of History and Philosophy of Science based on problematizations about reality has potential for Biology teaching, since, besides bringing students closer to scientific knowledge, it also allows discussions that help to locate scientific knowledge in its context and its social use.

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