Revista ARACÊ
ISSN: 2358-2472

THE OPEN AND FREE SOCIETY IN POPPER AND FEYERABEND AND THE PERCEPTION OF UNDERGRADUATES ABOUT ITS ASPECTS

https://doi.org/10.56238/arev6n3-115

Submitted on: 12/10/2024 **Publication date:** 12/11/2024

Guilherme Kunde Braunstein[1] and José Cláudio Del Pino[2]

ABSTRACT

When observing the development of science, authors such as Popper and Feyerabend discuss a series of elements that make society closed by directing, from political and economic elements, the knowledge that will be considered valid. In view of their questions, the present research sought to understand the perceptions that students of five undergraduate courses of a state university have about the issue. To achieve the objective, interviews were carried out, which were analyzed through a process of discursive textual analysis, which, in turn, indicated a series of agreements between Popper's and Feyerabend's explanations and the students' perceptions.

Keywords: Epistemology. Scientific Learning. Discursive Textual Analysis.

[1] Dr. in Science Education
State University of Rio Grande do Sul
ORCID: https://orcid.org/0000-0002-1210-104X
E-mail: guilherme-braunstein@uergs.edu.br
[2] Dr. in Biomass Engineering
Federal University of Rio Grande do Sul
ORCID: https://orcid.org/0000-0002-8321-9774
E-mail: delpinojc@yahoo.com.br

Revista ARACÊ
ISSN: 2358-2472

INTRODUCTION

Within the philosophy of science, epistemology is the area that seeks to understand the nature, justifications and scope of science, so that those responsible for such investigations are called epistemologists (MOREIRA; MASSONI, 2011), a group that has a number of prominent names, such as Gaston Bachelard, Paul Feyerabend, Thomas Kuhn, Imre Lakatos, Larry Laudan, Ernst Mayr, Karl Popper, among others. Even though many of these names share similar areas of training and seek throughout their writings to describe and problematize the same object, science, this does not mean that there is always agreement between their descriptions or that their models are mutually transposable. In reality, what can be observed is that a good part of their arguments are based on mutual criticism.

Although there is no agreement among epistemologists, it is possible to verify that they at least present the common proposal of structuring scientific practice in their contexts. Within this purpose, each of them focuses on different points, for example, Laudan brings as the focus of science the search for the identification and resolution of problems (2011 [1977]), Popper, in turn, structures the logic of scientific research in the construction and attempt to falsify statements (2013a [1959]), while Kuhn argues that exemplary manuals and practices end up introducing students to structured systems within which most of the time and for most people would only seek to broaden the field of application of theories that had already been consolidated (1982 [1962]), but that during certain periods movements of rupture with what had been accepted until then and the realization of true scientific revolutions would be observed (1982 [1962]). If at first it may seem strange that when looking at science these authors base it on different bases, a closer look at the situation may reveal that one of the reasons for this diversity of opinions is that all these models "were conceived either *a priori* to solve specific philosophical difficulties, or *post hoc* to fit a small number of pre-selected examples, it is not to be imagined that any of them could correctly tell the whole story or even large parts of it" (LAUDAN et al., 1993, p. 9).

Laudan and his collaborators, by evoking historical contingencies as a justification for the different explanatory formulations for the sciences, end up introducing into this discussion the idea that subjective concepts can somehow direct the paths of science. Such a proposal, in turn, even if it is not discussed in depth by some of the epistemologists, finds support in others, such as Kuhn (1982 [1962]), Feyerabend (2011a; 2011b), Popper (2012 [1945]; 2013b [1945]), Bunge (1980) and Laudan himself (2011 [1977]). Of these,

Revista ARACÊ
ISSN: 2358-2472

Feyerabend and Popper have works that deal specifically with the relationship of social aspects in the functioning of science and society.

In view of the exposed context, the present work aims to problematize, mainly from Feyerabend and Popper, the influences that social aspects have on the direction of science, focusing on its indications linked to political and economic aspects in which science is immersed. Having presented the reference in these two authors, we will proceed to the presentation of the data obtained through interviews directed to students of five courses of a state public university, which had as one of their purposes to try to understand if and, if so, to what extent they consider that scientific research in their areas is impacted by economic and political issues. thus observing how much the propositions of Popper and Feyerabend are received in the speeches of these students.

DEFINING FREE AND OPEN SOCIETIES

Several points could be explored from the analysis of Popper's "The Open Society and its Enemies" and Feyerabend's "Science in a Free Society". In the present work, however, we will focus on its definitions of free or open society, the way in which subjective elements can direct scientific research and how much political and economic issues can affect this same type of research.

Differentiating between open and closed societies, Popper brings an objective definition: "the magical or tribal or collectivist society will also be designated as a closed society and the society in which individuals are confronted with personal decisions by an open society" (POPPER, 2012, p. 218). Although simple, this definition offers space for questioning and reflection, one of the main ones being whether we live in an open or closed society. Thus, throughout their writings, these authors indicate a series of issues that contribute to the closure of society.

The links between science and society are a point indicated as relevant by different authors, Bunge (1980, p. 49), for example, argues that the scientific community "cannot exist in a social vacuum, if we are interested in stimulating or inhibiting scientific development, we must consider it as an aspect of the integral development of human society", Kuhn, in turn, he assumes the possibility that the social sciences offer answers as firm to his questions as those of the natural sciences (1982), while Laudan seeks in history, philosophy and sociology causes to be able to consider rational certain decisions made in science in certain contexts. Although these authors at some point weave relations between

Revista ARACÊ
ISSN: 2358-2472

society and science, Popper and Feyerabend end up standing out on this point due to the depth they offer to the subject and the focus given to social issues in particular works.

Starting with Feyerabend, this in his defense of a free society deals with both social issues and responds to oppositions directed to his work "Against the Method". One of his highlights is the explanation that his proposal of anarchism would be a remedy for the epistemology and philosophy of science and not for politics, that is, it is something to be used while it is a disease or illness (in this case the bias of science), but not after its cure (FEYERABEND, 2011a). For this reason, "Against the Method" would be a strategy to make science open, not a substitute system. Something vital to the point of stating that "in the Sciences [...] we often follow a specific line of research not because it is considered intrinsically perfect, but because we want to see where it leads" (FEYERABEND, 2011a, p. 26), thus, "there is no 'scientific method'; there is no single procedure, or set of rules, that is present in all research and guarantees that it is 'scientific' and, therefore, reliable" (FEYERABEND, 2011a, p. 122). In this way, something that would be sought in a free society would be the freedom to adopt a methodological plurality when investigating science or any other area.

Among the characteristics of a free and truly democratic society, for Feyerabend, is the expectation that people have the freedom to propagate the doctrine they want, as long as it is by their own means (FEYERABEND, 2011a). It is important to note, however, that wanting a system in which everyone has an equal right to express their opinions does not mean that everything is accepted individually, and there is the possibility of, without incurring in contradiction, advocating this right and even then ridiculing and accusing the opinions of others of incoherence (FEYERABEND, 2011a).

Another point linked to the freedom to defend beliefs is that related to the financing of proposals. In the author's expectation, it is considered that:

> The citizen has the power to give an opinion on the administration of any institution to which he contributes financially, privately or as a taxpayer: public colleges and universities, research institutions supported with public money [...] are subject to the evaluation of taxpayers [...]. If California taxpayers want their public universities to teach black magic, folk medicine, astrology, rain dance ceremonies, then that's what universities will have to teach. The opinion of experts, of course, will be taken into account, but they will not have the last word. The last word is the decision of democratically constituted committees, and in these committees, the laity have control. (FEYERABEND, 2011a, p. 118).

Revista ARACÊ
ISSN: 2358-2472

Even if considering the proposal of teaching black magic, astrology or, in other words, something like flat-earthism in universities or schools may be something that borders on the absurd, its argumentative basis is in reality quite simple: it is up to those who pay (the general population) to decide where to invest their money. This is because in a free society the choice between theories is made on their merits and not by pressures from one group, that is, allowing others to have the right to express themselves and use their own resources to defend their beliefs does not mean that we believe that they enjoy some merit, nor does the fact that the government decides where to invest mean that the money that is being used for it is of great importance. your property.

Still on the issue of funding and the power attributed to experts, Feyerabend ponders:

> Would it perhaps be better for taxpayers to accept the experts' assessment? No, and for obvious reasons. [...] First, the specialists have capital invested in the playpens themselves [...]. Second, scientific experts almost never examine the alternatives that may arise in the discussion with the care they presume is necessary when a problem, in their own area, is at stake. (FEYERABEND, 2011a, p. 167).

On the first point, the fact of receiving funding from one source alone can make judgments biased. On the second point, we tend to be more tolerant of the flaws of the theories we follow, than of the systems we do not master. In this regard, Laudan points out that empirical problems are usually ignored until someone can offer an explanation for them (LAUDAN, 2011). Along the same lines, Kuhn indicates that during periods of normal science "the failure to reach a solution discredits only the scientist and not the theory" (KUHN, 1982, p. 111), which will only be questioned when its anomalies become evident.

Still based on Feyerabend's positions, as he considers that "in cases where the work of scientists affects the public, the public would even have an obligation to participate" (FEYERABEND, 2011b, p.21), what would be the basis for a free society would be the possibility for all taxpayers to be able to choose in a qualified way the places in which to invest. Obviously, they are not expected to have a deep understanding of the areas of specialists, however, considering that the choices are made on merit, and science is undoubtedly worthy of merit, one would expect that the choices in favor of science to the detriment of other areas would be proportional to the clarity as to the return brought by it to society, In other words, considering the possibility that the best choice is to follow what science advises and in this being presented in an appropriate way to society, without overvaluing some areas and undervaluing others, there would be no reason to worry about

Revista ARACÊ
ISSN: 2358-2472

whether this will be understood as the most advantageous path. Within this context, science would only be disadvantaged if it remained distant from the society that funds it, or if in fact it had proposals with little merit.

Even though Feyerabend's position may raise insecurities as to the ability of the general population to be able or not to judge where resources should be invested, the author is not alone in his statements. In 1981, when dealing with racial and gender prejudices in science, Gould recalls that in Plato's republic "social and economic roles faithfully reflect the innate constitution of people" (GOULD, 1999, p. 4), referring to the passage in which Socrates explains that one would deliberately lie to the people by telling them "you are effectively all brothers in this city [...] but the God who fashioned you, those of you who were fit to rule, mixed gold into their composition [...]; to assistants, silver; iron and bronze to farmers and other craftsmen" (Plato, 2008, p. 109–110). Gould then explains that today "an aspect of intellectual strategy has undergone changes. Socrates knew he was telling a lie" (GOULD, 1999, p. 4) while the researchers he appointed would believe that by making use of science they would be bringing findings of a truth and not of their prejudices.

This same criticism of Plato's system is made by Popper, but in a way linked to political systems (such as those of Plato and Hegel) in which a ruling class believes it has the right to govern without the opinions of the governed, believing that by deceiving them "it is always success that counts. If the lie was successful, then it was not a lie, since the People were not deceived as to its substantive basis." (POPPER, 2013b, p. 83) or in which, as expressed by Plato "the wise must command and rule, and the ignorant must follow them" (POPPER, 2012, p. 155). Although the idea of the government of the wise is seductive, Gould (1990), when discussing how North American eugenic science identified those considered imbeciles, clearly brings the social bases that underpinned such judgments. Thus, the position that the population in general is not qualified to judge science should only indicate that it needs to receive a better qualified and critical education.

Still on the role played by education in the formation of a society with the capacity to judge, Feyerabend argues that "a democracy is a collection of mature people and not a collection of sheep guided by a small group of know-it-alls." (2011a, p. 108) and that such maturity "needs to be learned. And it is not learned in [...] current schools in which the student is faced with desiccated and falsified copies of past decisions; it is acquired through active participation in decisions that have yet to be made." (2011a, p. 108). In other words,

Revista ARACÊ
ISSN: 2358-2472

"it is necessary for [society] to know not only the concepts, but also what science is, the problems that triggered the studies, their methods, the expected results, and the consequences of their applications." (LIMA; CORAZZA; LUSTINA, 2019, p.89)

Returning to Popper, he criticizes Plato's model of republic in which "a monopoly of education by the ruling class, combined with the strictest censorship, even for oral debates" (POPPER, 2012, p. 168), is a system in which the "philosopher-king [...] must [...] be 'more courageous', since he has to be determined 'to minister many lies and deceit' – for the good of the governed" (POPPER, 2012, p. 176). In this context, the choice of what will or will not be taught, and the places that will or will not receive funding, permeates a series of power relations, which will not necessarily be the same as those assumed by other authors when they stick exclusively to what can or cannot be accepted as scientific.

If, from the point of view of restricted scientific systems, assuming a set of beliefs as fundamental and to a certain extent unquestionable, as proposed by Kuhn (1982) and Lakatos (1978), makes the decisions to be made more agile and precise, the same cannot be said of political systems, in which by assuming a single position, Whatever it may be, it contributes to the closure of society, because if from the point of view of those who live in an area following its rules is something natural and rational, for those who observe these same rules from the outside it is easy to recognize them as arbitrary and biased.

Thus, when making decisions of a political nature, one would expect, as an ideal, according to Feyerabend, to adopt a posture in which, when considering the methodological plurality observed in the history of science, one takes into account that "rationality is not the arbiter of traditions; it is itself a tradition or an aspect of a tradition. Therefore, it is neither good nor bad, it simply is" (FEYERABEND, 2011a, p. 36), as well as that in situations that demand decisions "rationalists and scientists cannot argue rationally (scientifically) in defense of the incomparable position of their favorite ideology" (FEYERABEND, 2011a, p. 98). Positions that are reinforced by Agassi by making clear the subjective load of scientific theories, pointing out that "obviously the theory 'a theory is scientific if it is empirically testable' is not empirically testable" (AGASSI; PARUSNIKOVÁ, 2017, p. 533), a position also reinforced by the anthropologist Descola, who states "I do not doubt the sciences, which would be absurd; What I contest is the idea that cosmology, which made the sciences possible, is itself scientific. No, it is not, it is historical, as are all cosmologies" (DESCOLA, 2016, p. 48).

Revista ARACÊ
ISSN: 2358-2472

If the exercise of breaking with ethnocentrism, as a belief that the best system for judging other cultures is always the one we follow, may seem challenging, works such as those of Miner (1956) and Bohannan (1966) contribute to understanding respectively how biased the view we adopt in our society can be and how enriching it is for our own area to review it from other references.

One of the arguments evoked when considering science and scientists as the best judges for decision-making is the supposed objectivity and neutrality of science, for Feyerabend "it is in this way that intellectuals try to convince their fellow citizens that the money paid to them is not wasted and that their ideology must continue to assume the central position it has now" (2011a, p. 40), for the author "the standards of such a debate are not 'objective'; they only seem to be so because the reference to the group that profits from their use has been omitted" (2011a, p. 40).

What happens, according to Feyerabend (2011a) (but also in Kuhn and Laudan), is that from the moment something starts to be treated as basic to science, any questioning directed at the area is not taken seriously. Popper supports this idea by pointing out "that this civilization has not yet completely recovered from the shock of its birth – the transition from the tribal or 'closed' society, with its submission to magical forces, to the 'open society', which frees the critical powers of man" (2012, p. 17), then discussing the different moments that in historical terms the idea of the existence of a chosen nation was used to justify discourses of racism, eugenics or upper class, which seek to make natural the idea that certain groups should govern and others should be governed.

Still on subjectivity and decision-making, Popper states that "there is no doubt that we all suffer from our own system of prejudices (or 'total ideologies', if you prefer that term)" (2013b, p. 261) making the accuracy of a statement not in minimizing the margins of error, but rather in recognizing the possibility of errors. What makes scientific objectivity lie in the fact that in order to "avoid misunderstandings, scientists try to express their theories in such a way that they can be tested, that is, refuted" (POPPER, 2013b, p. 262). Thus, the fact that in an open society "anyone can criticize is what constitutes scientific objectivity" (POPPER, 2013b, p. 265), however, this requires that the population be able to make this judgment in a qualified way.

Continuing with the question about the priority that science should have over other sources of knowledge, Feyerabend presents two reasons that are usually evoked to defend

Revista ARACÊ
ISSN: 2358-2472

the superiority of science: "it uses the correct method to obtain results; and there are many results to prove the excellence of the method" (2011a, p. 122).

Regarding the first point, to refute the idea of the existence of a single method to be used, it is enough to compare approaches from different areas, such as ethnographic (or autoethnographic) experiences and analysis of variance between population data, to observe that the instruments for data collection, treatments, arrival of conclusions, expectations of generalization, and possibilities of retesting are different in these systems.

With respect to the second reason, Feyerabend argues that the superiority of science in relation to other areas would depend on the fulfillment of two requirements: "(a) no other view has ever produced anything compatible and (b) the results of science are autonomous, owing nothing to non-scientific agencies" (2011a, p. 125). As for the first requirement, it ignores the value of traditional knowledge and communities other than the scientific ones, both current and past, to take it as true would be to ignore the contributions of in-depth works on the evolution of scientific thought, such as those of Bachelard (1996). As for the second requirement, it is enough to know that at the national level CNPq and CAPES are maintained with public money and that on a global scale the Web of Science platform is linked to the company Clarivate to verify that the results of science are often not independent of other agencies and are not politically neutral.

As for attributing to science a condition of superior knowledge, Popper, when criticizing Plato, brings the identification that "his philosopher is not someone dedicated who seeks wisdom, but rather the pride that possesses it. He is an educated man, a wise man" (POPPER, 2012, p. 182), who, by having a privileged place of power, believes he is able to replace one social system with another in a similar way to what is done with "a picture painted on a canvas that has to be erased before being able to paint a new one" (POPPER, 2012, p. 208), in a situation in which decision-making is carried out by someone outside the system.

According to Popper, an example of this attempt to replace systems and their practical results in science would be observable in the relationship between Hegel and Frederick William, the then king of Prussia, who offered the state's seal of approval for his propositions without taking into account the feasibility of the proposal (POPPER, 2013b). A similar proposition of state protection for certain lines of research is denounced by Feyerabend (2011a), who adds to it criticisms related to the practical results of the economic investments made by the state, bringing as an illustrative example the low gain in

Revista ARACÊ
ISSN: 2358-2472

knowledge resulting from the expenditure of billions of dollars on special programs to put man on the moon, compared to the intellectual gains of a philosophical character in other fields that do not receive the same emphasis or equivalent resources.

Another issue taken into account by the authors regarding the receptivity of scientific research within society is the clarity with which scientific terms reach it. In addition to the difficulties related to the vocabulary of the areas, there is the aggravating factor that decision-making and directing resources in the political sphere are carried out by people who do not have a deeper understanding of the applications of science, thus leading to decision-making that deviates from the rationality intended by science because, as expressed by Laudan, "no sensible rational evaluation of any doctrine is made without ample knowledge of its historical development (and of the history of its competitors)" (2011a, p. 272) and, as indicated by Feyerabend, at certain times the choices between theories are not based on rationality, but on the use of propaganda and psychological tricks (2011b).

Another element that would explain the favoring of certain lines of research would be the possibility of technical use of scientific findings. As an example of this, it is indicated that after the invention of the telescope given ruler "immediately realized the military value of the telescope and ordered that his invention [...] be kept secret" (FEYERABEND, 2011b, p. 121), later indicating that even the law discriminates against data as heresy and that there are "many legal, social and financial obstacles that assertions of knowledge face" (FEYERABEND, 2011b, p. 170) to be overcome before they are considered fit to have their validity verified.

Regarding the dissemination of knowledge, Popper and Feyerabend point out some attitudes that contribute to the closure of systems. One of these interventions would be Plato's aforementioned proposal according to which the state should intervene and, if necessary, through deception, prevent the transit between classes (Plato, 2008). It also proposes that education be controlled by the state, with the isolation of children from parents and other contaminants until they reach 10 years of age (POPPER, 2012), and "the institution that, according to Plato, has to take care of future leaders can be described as the state's department of education. From a purely political point of view, it is by far the most important institution in Plato's society" (POPPER, 2012, p. 169).

Regarding Plato's emphasis on education, it is obvious that to think that it in the republic is the same as the one with which it is worked today within schools and universities

Revista ARACÊ
ISSN: 2358-2472

would be a great anachronism, however, the validity of Popper's reference remains valid. In Plato and his republic, education is brought as training offered so that people work as efficiently as possible within the functions to which they were predestined and from which for the good of society they cannot be removed (Plato, 2008), but in current terms the school is still a privileged space for training and socialization.

Some positions defended by Hegel and Marx would also contribute to the closure of society, such as the belief that conflict between nations or class struggle are the basis of the history of all societies (POPPER, 2013b). Popper also attributes to Marx the idea that the capitalist system itself, by exploiting the governed, forces them to unify, however, believing that "the proletarian conscious of his class is the proletarian who is not only aware of his class situation, but also feels proud of his class and is totally sure of its historical mission" (POPPER, 2013b, p. 138) in such a way that there is not even the desire to change class, despite the fact that it is considered that even in a just society the proletarians "despite all this 'justice', would not be much better off than slaves. Because if they are poor, they can only sell themselves, their wives and children in the labor market" (POPPER, 2013b, p. 147). According to Popper's reading of Marx, the loyalty of proletarians would be such that even if they did not necessarily use violence in all actions, in favor of social change they would make "the decision not to back down in the face of violence" (POPPER, 2013b, p. 180) being "determined to use violence to achieve their goals" (POPPER, 2013b, p. 180).

With respect to the class struggle defended by Marx, it would be something different from what occurs within science, especially for reasons of intensity and objectives. While the class struggle in Marx has a final objective already known, that of through victory over the ruling class to establish a system in which there is no longer oppression and everyone belongs to the same class, within science one avoids visions that are seen as teleological, that is, in which the final destination would already be known from the beginning. Thus, even if Kuhn (2006, 2011), Laudan (2011), Lakatos (1978), Feyerabend (2011b) and the other epistemologists in their writings criticize and even seek to reduce each other's propositions to the absurd, such clashes could not be framed as enterprises of war or even violence, closer to Feyerabend's position that defending freedom so that everyone can express their opinions and seek adherents for their lines does not mean acceptance uncritical of other people's positions (FEYERABEND, 2011a). Furthermore, the way in which science faces these clashes of theories and confrontations between areas is not as a

Revista ARACÊ
ISSN: 2358-2472

search to definitively supplant one system by another, but within the logic exposed by Bachelard that "truth is the child of discussion and not the child of sympathy" (1978, p. 81).

Finally, thinking about the ideal conditions for the construction of a free society, what one would expect in Feyerabend would be a state that enjoys the same independence in relation to science as the one it should have in relation to religion (2011a) because, as pointed out by Popper, attitudes such as thinking with the class inevitably lead to a closed type of thinking (POPPER, 2013b) in which passionate attitudes are adopted. These, in turn, are dangerous to the extent that among all "political ideals, perhaps that of making people happy is the most dangerous. It invariably leads to an attempt to impose on others our scale of 'higher' values to make them realize what seems to us to be of greater importance for their happiness" (POPPER, 2013b, p. 283).

PERCEPTION OF UNDERGRADUATES ABOUT THE INFLUENCE OF SOCIAL ISSUES ON SCIENCE

Having discussed some of the influences of social aspects in scientific practice, it is proposed to verify the perception that undergraduates have about these relationships in their own courses. For this, students from five undergraduate courses at the State University of Rio Grande do Sul (UERGS) were taken as research participants, with whom a dialogue was conducted through guided interviews (PÁDUA, 2004). In total, 63 students were interviewed about different aspects related to the perception of scientific practice within their courses. Of these, 21 were studying Agronomy (Agro), 15 Food Science and Technology (CTA), 14 Bioprocess Engineering and Biotechnology (EBB), 8 Environmental Management (GA) and 5 Pedagogy (Ped). This participation was obtained by sending about 175 invitations to the students of each course, and later a larger sending was made to courses with lower adherence (for the GA and Ped courses, 242 and 225 were sent, respectively). Considering that the data collection took place through interviews, before they were carried out, the project was analyzed and approved by the Research Ethics Committees of the institutions involved (UFRGS and UERGS), being approved in both with CAAE 48745721.9.0000.5347 .

Throughout the interviews, a series of information related to the way students perceive the research in their courses was collected, however, in this work, the effects of factors such as politics and economics on the research carried out will be addressed,

Revista ARACÊ
ISSN: 2358-2472

which, once carried out, were transcribed and submitted to a process of discursive textual analysis (DTA) of the speeches based on the methodology of Moraes and Galiazzi (2016).

DTA is a methodology used to carry out discourse analysis in search of new relationships and emerging meanings, being a process with four successive and cyclical stages: a disassembly of the texts is made in order to build units of analysis; interrelations between the units are sought by performing the categorization; new meanings and possible readings are sought from the constituted relationships; a self-organized process naturally follows in which a new understanding of the discourses is achieved, allowing the cycle to be restarted (MORAES; GALIAZZI, 2016). One of the differentials of ATD in relation to other data analysis methodologies is that it favors the identification of contextual meanings.

After conducting and analyzing the interviews, the main positions identified in the participants, with regard to impressions about politics and economics, were categorized and tabulated (Chart 1), allowing a series of considerations to be made, in addition to parallels with the positions of Popper and Feyerabend.

Chart 1 – Units of analysis resulting from the interview with students of 5 undergraduate courses regarding the perception of the impacts of politics and economics on the research of the courses

	Agro	CTA	EBB	GA	Ped	TOT
Politics and economics influence a lot	7	8	8	2	4	29
Who defines or directs what would be relevant problems would be the government and companies	11	7	7	3	0	28
Economic demands influence more than political ones	5	1	6	4	1	17
Government finances what is interesting to it	8	2	5	1	0	16
Lack of funding for scholarships or human resources greatly impacts the possibility of doing research	5	4	3	2	1	15
Lack of funding is reflected in a lack of equipment or materials	3	4	1	1	1	10
Political and bureaucratic issues hinder research in all areas	1	3	4	0	1	9
As a public institution, politics influences a lot	2	0	4	1	1	8
Politics and economics are also affected by the ability to disseminate polls	0	2	2	2	0	6
The fact that the financing is done by governments is seen as something negative	1	2	2	0	0	5
Politics influences more, because they are the ones who make the laws	1	1	1	1	1	5
Political issues that occur in other countries have a national impact	1	4	0	0	0	5
Areas with potential for economic return are benefited	2	0	1	0	0	3

Source: Authors (2023). Legend: Agronomy; CTA: Food Science and Technology; EBB: Bioprocess Engineering and Biotechnology; GA: Environmental Management; Ped: Pedagogy; TOT: Total.

Revista ARACÊ
ISSN: 2358-2472

Starting with the common position of Popper and Feyerabend that politics and economics profoundly affect the development of science, the analysis of the data indicated that among the 63 interviewees, 29 demonstrated that they shared this belief. With respect to how much each of them influences, the thought that the economy influences polls more than politics predominated (17 of the 63 participants). Even in some cases where more importance was formally given to politics, this was done within a funding origin bias, as expressed by an Agro student:

> I think politics interferes much more because I do an internship in a public institution. I believe that the economic one does not have so much interference, [...] as I do an internship in a public institution and we are living in a moment of crisis, there are cuts: there is a lack of employees, sometimes there is a lack of equipment, something like that is missing, you know?

In the speech of this agronomy student, other issues that were pointed out are also raised, such as the impact on research being greater in his course because it is a public institution (8 of the 63 participants), as well as the weight that politics has on economic issues, such as the granting of scholarships and payment of employees (pointed out by 15 participants) and the purchase of equipment (according to 10 participants).

Regarding the importance of granting scholarships and financing equipment in scientific training, it is important to note that in Brazil a large part of the research is carried out in public institutions, so that their success contributes to Feyerabend's expectations that "a democracy [is] a group of mature people and not a collection of sheep guided by a small group of know-it-alls" (2011a, p. 108), as well as with the fight against the political model criticized by Popper in which "a monopoly of education by the ruling class, combined with the strictest censorship, even for oral debates" (POPPER, 2012, p. 168), a model paid for by the population, but which serves the ruling class.

Still on the direction of research funding and its contribution to the construction of a free society, some of the statements illustrate the importance of the issue. The first was given by a student who had already graduated in the area of natural sciences who sought a second degree at EBB, which illustrated political-administrative issues that interfere in research:

> [...] I believe that one of the biggest problems we have today within research in Brazil is the mismanagement of public money that is released for research. [...] Researchers should have a little more freedom, because man, it's all very bureaucratic. Nowadays to buy something you have to sign 80,000 papers and until you can buy [...] a gel to do PCR. It's very, very bureaucratic. You have to make 3 or 4 budgets [...]. Let's make

Revista ARACÊ
ISSN: 2358-2472

> a bid to see who will charge cheaper and then it will take 3 months to be able to buy a packet of gel.

With her speech, the student brings both the idea that political and bureaucratic issues hinder research (common to 9 of the 63 participants), and that the purchase of materials being made by the government is something negative (common to 5 of the 63 participants). It also reaffirms the problem indicated by Feyerabend (2011a) of having people far from the area they are judging as judges in decision-making processes, or in this case they purchase materials to be used by third parties ignoring the issue of quality.

Regarding bureaucratic and financial obstacles, their depth reaches such a point that it is sometimes a disincentive to continue in the field of research, as expressed by a CTA graduate, who, when presented to research in general (without having entered into the themes of this article yet), stated: "[...] Because of the way [my advisor] was, I had even thought about going into the field of science, research" but that, however, "this change of government [that took place in 2019] was very discouraged by her" as a result of the "cut in funds, cut in scholarships, [which] ended up impacting me in the decision not to follow this path", adding after some time: "I felt discouraged from doing science in the country, in this sense of research. Because for you to do science [...] you have to have resources, [...] and the resources that have to come, have to come from the government", taking into account that "inputs are extremely expensive, reagents are extremely expensive, equipment is extremely expensive". Thus, through their speeches, they indicate the direct impact that funding has on the development of researchers, something that is also central to Popper and Feyerabend.

Despite her discouragement with the path of researcher, the student also said: "we need science, without science we don't do anything", thus expressing the position that science deserves high esteem and is the best way forward. An idea later reinforced when she brought up the relevance of the Butantan institute's research that led to the development of the coronavac vaccine: "[people] are always suspicious: ah, coronavac is worse than pfieser, I don't know what. Dude, how do you know? Have you become *a vaccine sommelier*?". The speech at first suggests that the population is prejudiced not against science, but in relation to national science. Thus, on the one hand it is possible to question the capacity of the general population to judge scientific discoveries and the urgency of offering them a better qualified education, on the other hand, however, it ends up indicating the judgment that once something has been discovered by science, it may be

Revista ARACÊ
ISSN: 2358-2472

unquestionable. This last point is something repeatedly indicated by Feyerabend (2011a) as something inherent to the social logic in which we live, even if it can be criticized in its essence.

Another point to be highlighted in the speech of the same student concerns political issues. At one point she said "[...] People are very hostile, they are very: creating a pet politician. What they cannot understand is that the politician serves only to serve the people. What people do is the opposite." This speech at times comes close to the descriptions made by Popper of the functioning of closed societies, as all the responsibility for events is placed in the hands of rulers. The direct consequence of this for Popper, but also illustrated in the transcribed speeches, is that the development of the area now depends on the goodwill and financing of the government.

The same set of speeches also highlighted the linking of funding to the government, a view that is close to the Platonic ideal criticized by Popper (2012), as well as the ideal of the state defended by Hegel and Marx (POPPER, 2013b).

Another point highlighted by the student was the issue of valuing local research, something whose importance was perceived in the outburst after talking about the coronavac vaccine: "it is so expensive for you to import technology from other countries". In this regard, Bunge's (1980) position is especially relevant, according to which one of the requirements for science to be considered as developed in a place is the existence of incentives for both basic and applied science, which would provide a certain independence in relation to research carried out in other countries. Regarding this issue, it was also noteworthy that of the 5 students who indicated that they believed that political issues that occur in other countries have a national impact, 4 were from the same course (CTA) as the aforementioned student.

Still on the issue of funding, the students also indicated the possibility of research being sponsored by companies, as expressed by an Agro student:

> [Agronomy] is very influenced [by economic issues] because large companies sponsor research, right? As well as the institutions that are in the government that do the research. So I believe that this part is well influenced both politically and economically. A company, it will look for what will generate a return for it as well.

In his speech, the student brings the idea that themes that have the potential to bring financial returns tend to be favored (common to 3 of the 63 interviewees). In the case of government-funded research, similarly, there is a belief that funding is directed to topics of

Revista ARACÊ
ISSN: 2358-2472

interest to government officials (according to 16 of the 63 participants), as well as that the government and companies (indicated by 28 of the 63 participants) define what would be relevant problems. Some of these ideas were reinforced in the speech of an EBB student: "In my opinion, from the moment that there is an economic interest, research is directed, and this is the case in any area, right? Any course, the economic side ends up influencing a lot". The speech of a GA student also indicated the possibility of direction by the government: "as much as we want to study about something, if the government, right? In the case of the economy, politics, they are against it, everything will be more difficult to get the resources and everything else, so we can be boycotted." These statements indicate an alignment between the students' perceptions and those of Feyerabend on the subject.

Regarding the origin of the funding, whether of public or private origin, and the reflections of this in the research, the statement of an EBB student stood out:

> in countries like Brazil [...] we depend a lot on the current government, right? However, now, in countries like this, like the United States [...] private companies like that dominate, right? [...] So, in this way, the research generated in the area of Bioprocess Engineering and Biotechnology runs much more, often not for the sake of a good person, but for the financial issue. [...] So, we have a very strong economic issue behind it and with that the economy, politics is interested and comes behind.

In response to his answer, I ask if we could say that one of the systems, Brazilian or American, would be better than the other, to which he replies:

> Look, with all due respect: no. I see several mistakes in both, because like this [...]: in the private company, I'm going to demonstrate two mistakes, you're going to have an interest from a larger elite, you know? So it's that thing, you're not always going to dedicate yourself to research to help the world, right? He will dedicate himself to research to help that elite, that country there. Now, a federal issue, like, in our case, depending on the government cutting funds or not, managing badly or not, it will end up harming itself and harming the student's research.

From the student's speech, it is possible to highlight the point that private research sometimes serves an elite, so that "you will not always dedicate yourself to research to help the world", but to particular issues, suggesting that even if you apply methodologies accepted within science, it is possible to work with strong biases. On the other hand, in public financing there is a risk of the occurrence of the allocation of funds, as indicated by Feyerabend (2011a).

Regarding the response given to the lack of funding, the position presented by a CTA student deserves to be highlighted:

Revista ARACÊ
ISSN: 2358-2472

> [...] There was a year when there was a change in policy and then we ran out of scholarships and then all the scholarship holders were volunteers, right? But I think that politics and economics, first they are intertwined and they directly influence the scientist's work. So, we need resources and also the economy, it will affect the people with whom scientists will interact. So, many times we change our path through these policies, right? So we have to adapt all the time, right? Because of the policies.

In this speech, in addition to the statement that as researchers "we often change our path because of these policies", which illustrates the direction that politics gives to science, criticized by Popper and Feyerabend, the statement that due to funding cuts "we ran out of scholarships and then all the scholarship holders were volunteers" draws special attention. In this regard, drawing a parallel with Popper's description of Marx (2013b), it is interesting to note that if in Popper the idea of voluntary offer of services in favor of the establishment of a cause is presented as absurd and a challenge to the application of Marx's system, the student's testimony, on the other hand, indicates volunteering as a natural response to the cut in funding. Even if one can try to justify volunteering in research projects as a possibility of gaining experience for students, the naturalization of this process should at least be the target of criticism, since it is a situation that would hardly survive intact to estrangements such as those proposed by anthropologists such as Miner (1956) and Bohannan (1966).

On the awareness of budget cuts in the general population, a student of Ped commented:

> [Politics and economics] affect a lot, because with every cut we see on TV, in education, we cry inside here, because we base ourselves on these resources. [...] We are seeing more and more resources decreasing, teachers having to work hard. Even the teacher I work with in the morning, when she arrived to work at this school, at this daycare, had practically no toys. Why? The school had no resources, the municipality did not have the resources to move to school. So she brought her things, her children's toys.

In her speech, the student highlights the impacts that politics and economics have on her own work routine, in addition to research situations. His speech can be confronted with the criticisms that Popper directs at Marx, who believed that in favor of social change the working class would make "the decision not to back down in the face of violence" (POPPER, 2013b, p. 180) and even "use violence to achieve its goals" (POPPER, 2013b, p. 180). It turns out that as the government cuts funds and has as a response donations from teachers, which make it possible for the system to continue to function, the resistance that is being offered is of another order than the use of violence, which is precisely one of the arguments raised by Popper as a criticism of Marx's system.

Revista ARACÊ
ISSN: 2358-2472

To better contextualize the issue of nonviolent response to budget cuts (which in other contexts are characterized as patrimonial violence), it is useful to resort to the definitions made by Hannah Arendt when she proposed that "power and violence are opposites; where one absolutely dominates, the other is absent" (2021, p. 73). It so happens that in view of the situation narrated, the reading that is made in the light of Arendt is that if in the face of government violence - of not honoring financial obligations - there is a non-violent resistance that prevents the consequences of neglect, it is because the real power in this situation belongs to the teachers and not to the government itself. This conclusion is equally clear, when taking the constitutional definition itself that "all power emanates from the people, who exercise it through elected representatives or directly" (BRASIL, 2019, art. 1), in such a way that in the case of evident inefficiency in the exercise of power by elected representatives, there is still the exercise of direct power as a response of the people.

With respect to the conclusion that power belongs to those who can lead others to action, this is a basic principle of "The Republic", with the difference that the way in which Plato's philosopher-king guaranteed his power was through a government that encouraged lying as a benefit to the people of whom one is the guardian, that is, while Plato seeks to facilitate the exercise of power through the closure of society, in the case of resistance to the scrapping of education, what is sought, in the case of the teacher presented, is to use power in order to form subjects for an open society.

In opposition to the proposal of resistance to government cuts, there were some participants (5 of the 63 participants) who considered that politics influences more than the economy because it is responsible for the elaboration of laws, and researchers have no means of circumventing its restrictions. As expressed by an Agro student: "I think the main thing is politics, right, professor? Without politics, agronomists cannot act. Because they are currently the ones who make the laws." When asked how the laws affect research, he replied: "Okay, with the laws that are created, for example, in a certain area there is that law and the agronomist wants to produce, but there is that law that is preventing him from producing, so he will not be able to, he has to do other things or look for something else", pointing out that a series of pesticides have their sale regulated. A GA student said: "environmental management is very much linked to public agencies and now they try all the time to change resolutions, change laws, things that can harm [...] the environmental area and the enterprises as well".

Revista ARACÊ
ISSN: 2358-2472

It was noteworthy that both students presented above situate political agents as external elements: "they [...] who make the laws"; "They try all the time to change resolutions, change laws." This distancing and division of society in the dichotomy "us" and "them" is the target of criticism in Popper, who by exposing Hegel's theory that "the State, by its very essence, can only exist through its contrast with other singular States" (POPPER, 2013b, p. 80) also points out that the demarcation of borders in Hegel is the demarcation of the enemies to be fought. If, from Hegel's point of view, war between nations is the engine of history and if in Marx history is based on class struggle, what would be desired for the development of science according to different epistemologists would be something different: an environment of dialogue and argumentation (BACHELARD, 1978; BUNGE, 1980; KUHN, 2006; LAUDAN, 2011; POPPER, 2013).

Regarding the basis used by government officials for decision-making, the speech of a CTA student drew attention, who pointed out:

> Everything we do today is political in some way, right? [...] Unfortunately in our country we have an incentive... the lack of incentive to research, right? [...] So, the economy of a country and the policy of a country, if it is against, let's say, a study, if a guy goes there, for example, publishes a study saying [...] that transgenic corn is carcinogenic [...]. Like, [...] the guy proves there by A plus B that it really is a 50-year study, with I don't know how many there were a thousand people and control groups, everything is right, as it has to be within the standards and someone A or B comes, not necessarily a politician, but who has a very large influence at the political level and says that this is not how it works. It ends up interfering, right? Because people say, wow, I had all that work and it went down the drain by someone who is not even in the area, by someone who does not even know, someone who does not even know what he is talking about.

In his speech, the student considers the possibility of serious and well-founded research being invalidated based on the opinions of people who are not in the area and who have economic interests linked to the results they are questioning. A similar point is made by Feyerabend, however, questioning the excellence of scientific knowledge in relation to other sources of knowledge. In his critique, Feyerabend (2011a) points out that sometimes science criticizes other areas without knowing them, claiming resources for itself to their detriment. Drawing parallels between the student's positions and those of Feyerabend, it can be concluded that the use of power or influence in decision-making is not something linked to a defined group, but rather the condition of enjoying power.

Regarding the power exerted by the economy, repeatedly cited by Feyerabend (2011a) as a contributor to the closure of society and the influence of global demands that act on local policies (pointed out by 5 of the 63 participants), an Agro graduate stated:

Revista ARACÊ
ISSN: 2358-2472

> [...] Actually, it's the following, it's no use, our world today is a capitalist world, we know that we depend on several environmental factors, but money rules, and often money rules people who don't have a more enlightened point of view [...]. The problem is that the world is labeled with half a dozen grains, you know? It's soybeans, corn, wheat and you stay at it and the system works for that. [...] He overvalues some things and others they forget. So, regional values end up being lost to world values. Today we know that the Chicago stock exchange is in charge of soybeans and the producer here can pay whatever he wants, he can receive whatever he wants, but the one who is in charge is there, right? So you make a production and dependent on another country.

Another issue raised by the interviewees was that as universities are able to give social returns, it becomes easier to receive government incentives, as expressed by a GA student:

> [in the city of the unit], the people who are governing today have a very strong identification with UERGS, but, of course, for other reasons not only because they think about environmental preservation, right? But why do university work help a lot, right? But there are other places, because I am a resident of [another city], there is already another thought much more distant from these environmental issues, right?

In his speech, the student indicates that when understanding a system it becomes easier to make use of it for one's own benefit, such logic is contemplated by the criticisms made by Popper (2012; 2013b) and Feyerabend (2011a) to political systems, with the difference that in these the understanding of systems is something planned and prior to its execution.

Another point observed was the position of some participants that in the same way that politics and economics affect science, science also affects them (position of 6 of the 63 participants). According to one CTA graduate:

> When you do science, we can't think only about the method, we have to think, who is going to reach with that method that you are doing. There are also variables, let's suppose in the environment, environment. How much are you going to affect not only the economic part of the money, but let's suppose: we do waste management, we have to understand that process that is developing or the one that is inserted that already exists, you are going to act, you have to know the consequences of each act that you are going to do there.

In her speech, the student brings some applications of the research carried out in her area, which, in turn, end up being incentives for investments.

A final point highlighted in one of the statements was that a lot of scientific information does not reach the public in an appropriate way, as expressed by an EBB student:

Revista ARACÊ
ISSN: 2358-2472

> I even thought it was funny the other day, [because] I have a hamster and in its box it is well specified that all the products used are not transgenic. [...] I think there's sometimes a lot of false advertising in this, you know? [...] I think there's a lot of information missing, you know? To the public about transgenics. The European Union, it does not accept that tobacco is transgenic. It can have millions of harms, it kills, it brings cancer, but it can't be transgenic, because the public won't accept it. They do not accept that it has been modified. Like, it's a lot of misinformation, you know? Like, something that could decrease, because whether you like it or not, when you smoke most of what you're ingesting it's bad for your body. And if it manipulates there, making the plant transgenic, it will help. But the European Union, it does not accept. And it is one that most asks Brazil to export.

In his speech, the student discusses the impact of the lack of information on the acceptance of technologies and products developed by science, which is one of the central issues both for the development of an open and free society, and for ensuring that science receives its due merits. It is no coincidence that, as indicated by Popper (2012), one of the most important steps towards the closure of societies is precisely the control of what is taught from the most basic levels of education.

CONCLUSIONS

Popper's "The Open Society and Its Enemies" and Feyerabend's "Science in a Free Society" are works that denounce the evils of a closed society, doing so after their authors have witnessed the horrors of war and have been modified by it. In addition to the basis that these authors have to deal with social issues, both are basic references when discussing the way in which scientific knowledge is produced. Thus, the implications pointed out by them of social issues on the development of science are of high relevance.

Among the main points made by Popper and Feyerabend about the closure of society are the concentration of power in the hands of specific groups (such as government officials, companies or the researchers themselves), the requirement of subservience to funding groups and the very possibility that those in power have to make the system favor their permanence in decision-making positions. In addition to these issues, another factor that favors the closure of society is the restriction of access to reliable sources of information and the communication failures that exist between science and society, which on the one hand require unquestionable faith in their findings, but on the other hinder the population's access to positions of power.

By adding to the notes of Popper and Feyerabend the perceptions of the students themselves, it was possible to identify a series of common points, starting with the perception that scientific practice is deeply impacted by political and economic issues to

Revista ARACÊ
ISSN: 2358-2472

which it is subjected. Some of the most direct ways in which students reported perceiving this were situations involving some type of demand for funding, such as research grants, equipment or laboratory materials. Regarding the importance of political issues, there were two antagonistic positions among the participants: on the one hand, some students identified its relevance as it has the power to impose and modify laws to be followed, while on the other hand, the idea was expressed that as one knows the functioning of the policy, it is possible to use it in favor of the development of research.

Regarding the students' perception of the direction of the research, their conclusion was close to those of Popper and Feyerabend: governments and companies preferentially finance what is of interest to them, which is why Feyerabend's argument that science sometimes moves more through the ability to advertise than through paths considered rational should be taken seriously.

Regarding the considerations directed to research carried out at the national level, the idea that the financing of research in the country with public funds is something negative has been expressed several times, partly because the government gives its opinion in areas that are not within its domain and partly because of the problems of bureaucracy. It also drew attention to the fact that even though the research is carried out at the national level, it would be strongly influenced by international issues.

Finally, it was positive that when faced with the question of how much politics and economics affect the areas of the undergraduates of the five courses, most of the participants not only took a stand, but presented arguments in defense of their conceptions, indicating that they are somehow aware of the political issues that surround them and that, sometimes, direct their research. In view of this observation and in view of the contributions of Popper and Feyerabend, it becomes possible to glimpse, even though elements inherent to closed societies are also observed, at least some of the fundamental elements for the construction of a society that is truly open and free of directions.

Revista ARACÊ
ISSN: 2358-2472

REFERENCES

1. Agassi, J., & Parusniková, Z. (2017). Reason, Science, Criticism. Organon F, 24(4), 526–545. https://www.ceeol.com/search/article-detail?id=692629

2. Arendt, H. (2021). Sobre a violência. Rio de Janeiro: Civilização Brasileira.

3. Bachelard, G. (1978). A filosofia do não. São Paulo: Abril Cultural.

4. Bachelard, G. (1996). A formação do espírito científico: contribuições para uma psicanálise do conhecimento. Rio de Janeiro: Contraponto.

5. Bohannan, L. (1966). Shakespeare in the Bush. Natural History, Aug/Sept. https://www.naturalhistorymag.com/picks-from-the-past/12476/shakespeare-in-the-bush

6. Brasil. (2019). Constituição da república federativa do Brasil. Brasil.

7. Bunge, M. (1980). Ciência e desenvolvimento. São Paulo: Editora da USP.

8. Descola, P. (2016). Outras naturezas, outras culturas. São Paulo: Editora 34.

9. Feyerabend, P. (2011a). A ciência em uma sociedade livre. São Paulo: Unesp.

10. Feyerabend, P. (2011b). Contra o método. São Paulo: Unesp.

11. Gould, S. (1999). A falsa medida do homem. São Paulo: Editora Martins Fontes.

12. Gould, S. (1990). A filha de Carrie Buck. In O sorriso do flamingo (p. 424). São Paulo: Livraria Martins Fontes Editora LTDA.

13. Kuhn, T. (1982). A estrutura das revoluções científicas. São Paulo: Editora Perspectiva.

14. Kuhn, T. (2011). A tensão essencial: estudos selecionados sobre tradição e mudança científica. São Paulo: Unesp.

15. Kuhn, T. (2006). O caminho desde a estrutura. São Paulo: Unesp.

16. Lakatos, I. (1978). La metodología de los programas de investigación científica. Madri: Alianza editorial.

17. Laudan, L., Donovan, A., Laudan, R., Barker, P., Brown, H., Leplin, J., Thagard, P., & Wykstra, S. (1993). Mudança científica: modelos filosóficos e pesquisa histórica. Estudos Avançados, 7(19), 7–89. https://www.scielo.br/j/ea/a/9BHrFV8WCRN5qmhVZM6qZwr/

18. Laudan, L. (2011). O progresso e seus problemas: rumo a uma teoria do desenvolvimento científico. São Paulo: Unesp.

Revista ARACÊ
ISSN: 2358-2472

19. Lima, M., Corazza, M., & Justina, L. (2019). Concepções acerca da história e epistemologia da biologia apresentadas em uma comunidade de prática. Revista Contexto & Educação, 34(107), 88–103. https://doi.org/10.21527/2179-1309.2019.107.88-103

20. Miner, H. (1956). Body Ritual among the Nacirema. American Anthropologist, 58(3), 503–507. https://www.sfu.ca/~palys/Miner-1956-BodyRitualAmongTheNacirema.pdf

21. Moraes, R., & Galiazzi, M. (2016). Análise textual discursiva. Ijuí: Editora Unijuí.

22. Pádua, E. (2004). Metodologia da pesquisa. Campinas: Papirus.

23. Platão. (2008). A República. São Paulo: Editora Martin Claret.

24. Popper, K. (2013a). A Lógica da Pesquisa Científica (2. ed.). São Paulo: Cultrix.

25. Popper, K. (2013b). A Sociedade Aberta e os Seus Inimigos: Hegel e Marx (Volume 2). Lisboa: Edições 70.

26. Popper, K. (2012). A sociedade aberta e os seus inimigos: O sortilégio de Platão (Volume 1). Lisboa: Edições 70.

27. Silva Junior, P. (2022). O conhecimento escolar em foco: currículo e epistemologia em debate: School knowledge in focus: curriculum and epistemologies in discussion. Revista Contexto & Educação, 37(116), 367–385. https://doi.org/10.21527/2179-1309.2022.116.10499