

Education for the Public Understanding of Science and Scientific Responsibility: Reflections in the Midst of a Pandemic

 Washington Luiz Pacheco de Carvalho¹

 Lizete Maria Orquiza-de-Carvalho¹

¹Universidade Estadual Paulista (UNESP), Programa de Pós-graduação em Educação para a Ciência, Bauru, SP Brasil.
E-mail: w.carvalho@unesp.br, lizete.orquiza-carvalho@unesp.br

Assuming credibility to be the probability of scientists' receiving support from non-specialized audiences (BARNES, 2005), we realize that the subject is delicate, since their connection with the institutions / organizations they represent is a fundamental factor in this theme. Among the instances that support the author in raising the question of undermining the credibility of institutionalized science, we find the occurrence of bovine spongiform encephalopathy, commonly known as "the mad cow disease", disseminated among English cattle herds in the early nineties. Barnes claims that, at that time, the fact that the Ministry of Health endorsed an independent scientific opinion, which had been commissioned to try to reassure the population of the absence of risk in the consumption of beef, ended up not only casting doubt on the report but also making room for public opinion that the government had lacked social responsibility.

In our opinion, the issue of scientific credibility is a good entry into a discussion about the dramatic planetary scene, in which we are all immersed and whose centre is an intricate pandemic situation. This crisis seems to drag a dizzying social, economic, cultural, emotional whirlwind around it. The number of people infected with the coronavirus confirmed by tests, as well as the number of official deaths caused by the COVID-19 disease have grown very quickly and frighteningly. Guidelines from the World Health Organization (WHO) on social distancing, personal hygiene, quarantine and lockdown have been presented and supported both as means of trying to control the speed of viral transmission and avoiding lack of hospital beds for the treatment of severe cases of the disease. On the other hand, we have seen that scientific aspects of the problem have been widely exposed in the media, such as the non-existence of a vaccine that immunizes against the virus or drugs that are widely accepted by medical science to inhibit the action of the virus. This incipience, that is legitimately inherent in the process of producing research results, in the case of this pandemic, also exposes a difficulty for the public to understand the timing of science.



This has caused the use of various didactic resources by public institutions and bureaucratic bodies so that the population could reach a minimal and overall understanding of the situation and make sense of the guidelines urgently.

We realize that strong socioeconomic implications of the WHO guidelines were revealed, governments in many countries were initially resistant to them and, later, some leaders even proved to be nonconformist and willing to discredit them, as is the case in the USA and Brazil. In these countries, the adoption of scientific recommendations has been treated as being inconvenient to their projects of political power, which poses a threat to scientific credibility. In the case of the American government, there was even an explicit charge, in an official statement by the president, against the World Health Organization, claiming that it had not have issued an adequate warning about the dangers of coronavirus, which contributed, therefore, to the Chinese government spreading wrong information about COVID-19. In addition, in retaliation, Trump withdrew the financial contribution to WHO. Another aspect that can be identified as a sign of an attempt to undermine scientific credibility in the US and Brazil are disputes related to the use of the drug hydroxychloroquine and its initially promising results. In Brazil, the drug was hastily recommended in a presidential speech, without due consideration of scientific criteria on the circumstances for its use and, later, after a period of debate within the scientific community, the president of the Federal Council of Medicine came to the public to detail such circumstances, which meant an attempt to safeguard scientific credibility.

In the last few decades, suspicion has increased that the issue of scientific credibility may be part of a larger problem of trust that, in general, affects institutions (O'NEILL, 2002) since they have become increasingly more complex, insofar as their initial commitments, such as working for public interest, have become out of focus, with a view to establishing alliances with private companies. In this sense, several authors prefer to use new terms to refer to what they understand to be the current scientific enterprise, such as technosciences (HOTTOIS, 1991) and post-academic science (ZIMAN, 1996).

More than fifty years ago, Herbert Marcuse already denounced a strong identification between scientific enterprise, technology / industry and social domination:

The fact that the organization and control of entire populations, both at times of peace and of war, has in the strict sense become scientific control and organization (from the most common technical household appliances to the most sophisticated methods of forming public opinion, advertising and propaganda) inextricably links research and scientific experiments with the powers and plans of the economic, political and military establishment. Consequently, there are not two worlds: the world of science and the world of politics (and its ethics), the realm of pure theory and the realm of impure practice - there is only one world in which science, politics and ethics, theory and practice are inherently linked. (MARCUSE, 2009, p. 160, our translation).

More recently, we can find studies that explain the fusion between science and politics/governance, which highlight the realization of these new alliances, such as Langley and Parkinson's (2009, 2011), when examining government policy initiatives in force for two decades in the United Kingdom, which recognized close links between private companies and universities and described them with a category chart:

"diversion by sponsorship", which consists of choosing university scientists who are, in advance, favourable to the interests of funders; "Confidentiality agreements", which give companies intellectual property rights; "Conflict of interest", which denote the potential of financial interest to impact on the process of conducting the research; "The economic criterion", which consists of prioritizing the economic contribution for the elaboration of the public research and development policies; and "The organization of universities as a company", in which the academic ethos that involves values such as transparency, objectivity and autonomy are undermined in the name of factory-style productivity. This framework, which certainly holds similarities with others in the world science panorama (GIBBONS, 1994; SLAUGHTER; RHOADES, 2004), is at the heart of the financial negotiation of the scientist's institutional and individual autonomy and, therefore, brings us back to the questions of credibility, but at an expanded and much more complex level.

It is in this perspective that the question of public understanding of science is framed (MILLER, 2004), or, as Stengers (2018) conceptualizes it, public intelligence in science, as a challenge in exploring the existing distances between what the scientist says he is doing, what he is actually doing and what it could do. In fact, the scientist has learned that the best place for him to be today when he presents himself publicly is that of someone who speaks for the so-called academic science (ZIMAN, 1996), which means responding to values such as autonomy, public interest and responsible ethics. However, the actual question of public understanding of science puts him elsewhere, and from there demands clarification on the old questions, which he does not know how to provide.

Studies on popularization of sciences, such as those by Vogt and Polino (2003), and Vogt *et al.* (2005), carried out within the scope of South American countries, provide, in our view, good support for the affirmation that credibility in scientific institutions depends to a great extent on the fact that the population has not been educated to question and understand the processes and interests involved in the production of scientific knowledge. Certainly, the burden of this claim falls especially on us, researchers in the field of science education, as it presents us with the need for a discussion on how to act in order to promote a broader understanding among the population around the rooting of bonds between science, technological production and economic development, as well as the ways in which it is affected by the process. Certainly, it is also necessary to consider the implications for the growth in socio-environmental risks, which increasingly need to be managed in a new logic (BECK, 1992). From this, we conclude that the phenomenon of the undermining of scientific credibility, which ended up becoming a complex problem of the understanding of and about science, now finds a fruitful moment for reflecting on the destabilization of the historically crystallized idea that science produces knowledge predominantly with a view to public interest.

Thus, a question regarding scientific responsibility that we have announced in the title comes into play. Marcuse (2009) exposes a contradiction, describing it, on the one hand, as a historically split concept, since, in modern times, it is not up to the individual scientist to even consider the question of the social purposes of his work.

The problem is that it is not 'fraud' that penetrates the scientific process, but perfectly legitimate 'scientific' tasks and objectives. The scientist is presented with problems that are within his competence and interest as a scientist: scientific problems; it turns out that they are also problems of life destruction, chemical and bacteriological warfare. However, if science's self-correcting mechanism does not address these problems, the emphasis on the self-critical nature of science loses much of its validity. (MARCUSE, 2009, p. 162, our translation).

We believe that Marcuse's contribution brings us a little closer to the scientist at the time of science today (which we assume to be post-academic / technosciences), whose attention needs to be drawn. On the other hand, the philosopher argues that science, as a value domain, cannot be separated from its commitment to life.

Science, like all critical thinking, has its origin in the effort to protect and improve human life in its struggle with nature; the internal telos of science is nothing more than the protection and improvement of human existence. This has been the *raison d'être* of science, and its abandonment is equivalent to the breach between science and reason. (MARCUSE, 2009, p. 164, our translation).

In this perspective, the cleavage that marks the thinking of today's scientist in relation to the ideals of academic science, to which he imaginarily responds, does not in any way address the critical and liberating potentiality maintained in the history of scientific reason. This can be seen in the recovery of scientific thinking in universities from its beginning in the 11th century, with Goergen (2014). Thus, despite the reality of current science, we agree with Marcuse (2009) about the need to hold that the scientist will never cease to be responsible not only for the appropriation that society makes of science, but also for the consequences that arise from that.

In particular, if we assume that science has historically been constituted as a community committed to public interest, to be noted also by the very idea of publication, we have to recognize that private science, committed to the interest of industry, or even the public when contaminated by private interests, it is not oriented towards this publicity of scientific knowledge, neither before its publication, for reasons of patent or intellectual property, nor afterwards, due to the commercial interest of not revealing what cannot be revealed. Obviously, for scientists to continue to aim for higher positions in the scientific field and, at the same time, to preserve particular interests, they publish in a strategically engineered way.

It seems to us, then, that, in this pandemic moment, there is a growing awareness that we are all immersed in the same complex reality, scientists, philosophers and sociologists of science, journalists, science teachers, researchers in science education, the population and so on. In this perspective, the strangeness of Stengers (2018) in face of the idea of "public understanding of science" helps us to visualize ways for scientific education in the sense of a possible contribution to bring together people of different interests and views of science. The author claims that the term "understanding" brings with it an overvaluation of facts, to the detriment of values, following a tradition in which the image of the scientist that comes to us carries with it an authoritarian bias that science affords. It is in this perspective of criticism of the one-sidedness of technoscientific rationality that she puts forward the idea of public intelligence in science.

For Stengers (2018), the authoritarianism of the scientist is evidenced in the imposition on the public of how a conversation with him should occur, which in itself constitutes a confrontation of difficulties to move towards "public intelligence in sciences". An interesting example is the speech of a doctor and researcher, in an internet publication entitled *The vision of a scientist: in the midst of the pandemic, how to ask the right questions* (FINGER, 2020). By presenting himself as a scientist who has been willing on several occasions to talk to the public, through interviews with journalists, we understand that here he assumes his social responsibility. However, this researcher understands that he needs to "impose limits on journalists", which he attributes to the nature of scientific work itself. At another moment, he reveals a near impossibility of exercising abdication, during a conversation with the public, his position as a specialist. He then questions the impertinence of journalists that ask questions such as *Based on the Chinese experience, the Korean experience and the number of people tested in Brazil, how many asymptomatic individuals infected by covid-19 circulate among us without a diagnosis?* However, we ask, why could such "impertinence" not be part of the conversation? The willingness to answer an inappropriate question can, in our understanding, show the authenticity of the scientists' interest in getting closer to society, since the qualification scientists have in their fields includes skills to develop chained reasoning, expose analytical criteria, make hypotheses etc. They should not forget, however, that what potentially interests society is not the presentation of a seminar or a conversation between peers, but rather the confrontation of issues inserted in their lives. This would certainly require an improvement on the part of scientists to move from what is scientific to what is general, social and environmental, and vice versa.

Faced with frequent observations that the post-academic science scientist has nothing but a position of authoritarianism when talking to the public, we feel, like Stengers (2018), indignation in the face of so much indifference (excess of credibility) in face of a world in which people are more and more exposed to risks associated with products resulting from scientific and technological development (perceptible or not). Such a state of affairs invariably leads to undesirable confidence or to the cultivation of suspicion based on avalanches of fake news, which shows the public's lack of criteria for evaluating sources of information. In this sense, learning to recognize and discuss the reliability of institutionalized knowledge is at the heart of the development of this idea of public science intelligence, which implies, among other things, coping with having access to it.

We understand that it is from the perspective of recognizing the terrain of scarce interaction between different types of parties that are affected by and/or responsible for the paths of science that the roles of *connoisseurs*, as presented by Stengers (2018), seem productive in pointing out ways for research in science education in the field of public intelligence in science. The term would designate people capable, on the one hand, of cultivating scientific knowledge not as experts, dogmatic advocates, or irresponsible accusers, and, on the other, of making themselves available to understand the reasons why the public asks particular questions. The author identifies *connoisseurs* as amateurs who, in possession of fundamentals in science that they acquired in basic education, continue to be interested in keeping up with scientific subjects, in discussing them, in constituting questions to be asked to specialists, in short, people who go deeper into scientific processes, offering questions that fall within the domains of ethical responsibility, interests, financiers and scientific authoritarianism; that is, who encourage questions in those sectors that scientists are not usually interested in answering, or that they have learned to avoid.

Finally, we draw attention to the possible fertility of the concept of connoisseurs, noting that a large number of scholars from the most diverse areas (economists, philosophers, sociologists, geographers, political scientists, politicians, leaders of social movements, among others) have come to the public to talk about the pandemic, exposing themselves to an exercise of trying to bring together their different interests and perspectives of analysis of a topic that is originally related to the areas of health and biology. This fact certainly opens up an interesting field for discussions about the rapprochement between scientists and society. In particular, if, on the one hand, it seemed very promising that, among scholars, scientists in the medical and biological fields have also frequently appeared on television, on news programmes or special programmes, revealing situations in which the exposure time is longer than usual, on the other hand, since these are previously structured events in which specialists are prepared to answer journalists' questions that are supposedly of public interest, this mediation does not seem to be something so favourable to the intended public intelligence in science, to the extent that the commitment to "take the information to ..." is more expressed. In this regard, Nassi-Calò (2016) draws our attention to the fact that the number of initiatives taken by entities for scientific dissemination is much larger than we imagine promoting the interaction between scientists and the public without mediation:

Many scientists admit that dealing with journalists to address complex topics related to their research is not an easy task. There is a risk of oversimplifying matters or using very technical language and jargon whose meaning is unknown to most people. An alternative found by researchers was to eliminate intermediaries – journalists – and have researchers to interact directly with the public. Publications like *Scientific American* – which have versions in different languages, including Portuguese, and science websites of major newspapers in many countries have been doing this for decades. Today there are numerous blogs and social media dedicated to this, notably *Science Blogs*, the largest network of science blogs in the world that deals with topics such as natural sciences, culture and politics, launched in 2006 in English, and two associated networks: Science Blogs Germany with 25 blogs and Science Blogs Brazil with more than 40 blogs, launched in 2008 (NASSI-CALÓ, 2016, our translation).

As we reflect on the areas of scientific responsibility, exploring the difficulties that are inherent in it, especially those that refer to credibility, institutionality, interests and alliances, in light of such remarkable events in the lives of people worldwide, in which science has been exposed every day, and more intensely, in the media, we understand that the centre of our argument is located in the need that the education of people, in the perspective of the public intelligence of science, has as one of its objectives to reach the responsibility of scientists, which means to contest the fact that the science they practice is, *a priori*, aimed at the public interest.

References

BARNES, B. The credibility of scientific expertise in a culture of suspicion. *Interdisciplinary Science Reviews*, v. 30, n. 1, p. 11-18, 2005. DOI: <https://doi.org/10.1179/030801805X25882>

BECK, U. *Risk society: towards a new modernity*. London: Sage, 1992.

- FINGER, E. A visão de um cientista: em meio à pandemia, como fazer as perguntas certas. *Observatório da Imprensa*, ed. 1082, 7 abr. 2020. Retrieved Apr. 17, 2020 from: <http://www.observatoriodaimprensa.com.br/coronavirus/a-visao-de-um-cientista-em-meio-a-pandemia-como-fazer-as-perguntas-certas/>
- GIBBONS, M. *et al.* *The new production of knowledge: the dynamics of science and research in contemporary societies*. London: Sage, 1994.
- GOERGEN, P. Tecnociência, pensamento e formação na educação superior. *Avaliação*, Campinas, v. 19, n. 3, p. 561-584, 2014. DOI: <https://doi.org/10.1590/S1414-40772014000300003>
- HOTTOIS, G. *El paradigma bioético: uma ética para la tecnociência*. Barcelona: Anthropos, 1991.
- LANGLEY, C.; PARKINSON, S. A ciência e a agenda empresarial: as consequências nefastas da influência comercial sobre a ciência e a tecnologia. *Scientiae Studia*, São Paulo, v. 9, n. 3, p. 677-84, 2011. DOI: <https://doi.org/10.1590/S1678-31662011000300012>
- LANGLEY, C., PARKINSON, S. *Science and the corporate agenda: the detrimental effects of commercial influence on science and technology*. Folkestone: Scientists for Global Responsibility, 2009.
- MARCUSE, H. A responsabilidade da ciência. *Scientiae Studia*, São Paulo, v. 7, n. 1, p. 159-164, 2009. DOI: <https://doi.org/10.1590/S1678-31662009000100008>
- MILLER, J. D. Public understanding of, and attitudes toward, scientific research: what we know and what we need to know. *Public Understand of Science*, London, v. 13, n. 3, p. 273-294, 2004.
- NASSI-CALÒ, L. Como se relacionam pesquisadores e jornalistas no Brasil? *SciELO em Perspectiva*, São Paulo, Aug. 17, 2016. Retrieved Apr. 17, 2020 from: <https://blog.scielo.org/blog/2016/08/17/como-se-relacionam-pesquisadores-e-jornalistas-no-brasil/>.
- O'NEILL, O. *A question of trust*. Cambridge, UK: Cambridge University Press, 2002
- REIS, V. M. S.; VIDEIRA, A. A. P. John Ziman e a ciência pós-acadêmica: consensibilidade, consensualidade e confiabilidade. *Scientiae Studia*, São Paulo, v. 11, n. 3, p. 583-611, 2013. DOI: <https://doi.org/10.1590/S1678-31662013000300007>
- SLAUGHTER, S.; RHOADES, G. *Academic capitalism and the new economy: markets, state and higher education*. Baltimore: The Johns Hopkins University Press, 2004.
- STENGERS, I. *Another science is possible: a manifesto for slow science*. Cambridge: Polity Press, 2018.
- VOGT, C.; POLINO, C. *Percepção pública da ciência: resultados da pesquisa na Argentina, Brasil, Espanha e Uruguai*. Campinas: Editora da Unicamp; São Paulo: FAPESP, 2003.
- VOGT, C. *et al.* Percepção pública da ciência: uma revisão metodológica e resultados para São Paulo. In: LANDI, F.; GUSMÃO, R. (ed.). *Indicadores de ciência tecnologia e inovação em São Paulo 2004*. São Paulo: FAPESP, 2005. v. 1, p. 12-1/12-28.
- ZIMAN, J. Postacademic science: constructing knowledge with networks and norms. *Science Studies*, London, v. 9, n. 1, p. 67-80, 1996.