SCEINCE, ETHICS, AND THE PANDEMIC

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The Pandemic Between Ethics and Science

In an article titled "La pandemia, la scienza e il libero arbitrio" (Pandemic, science and free will) published in late August 2020 in the review L'Internazionale, the Slovenian philosopher Slavoj Žižek explains how, all over the world, the predominant attitude towards the pandemic is not, as we would expect, a deep interest and determination to know and understand how the virus functions in order to be able to control and to stop its diffusion. On the contrary, the most common attitude is "a will not to know" too much about it because, otherwise, we ought to be ready to treat the pandemic not only as a health issue, but as something that is deeply embedded in our human relationship with nature and our ideological and social relationships.[1]

[1]Slavoj Žižek, "La pandemia, la scienza e il libero arbitrio," *L'Internazionale,* August 22, 2020, 1-3, https://www.internazionale.it/opinione/slavoj-zizek/2020/08/22/pandemia-scienza-libero-arbitrio.

This "will not to know" is masked by people who claim that to be aware and informed is to use one's argumentative tools to affirm and justify false and superficial beliefs and statements regarding the pandemic, the prevention of infection, and vaccination. This is particularly dangerous when these people are somehow acknowledged as "philosophers" and play the role of opinion makers using mass media. The risk is that, as Giovanni Boniolo states in an article that appeared on the Huffington Post in January 2022, they may influence those who are epistemically fragile and feed a self-referential and disengaged positioning towards the pandemic.[2]

Choosing to know has deep ethical and moral implications since, once we are aware of the interwoven factors that have determined the environmental conditions conducive to the spreading of the pandemic, as well as of the consequences and outcomes of individual and collective choices, we have to act and behave in new and different

[2] Giovanni Bondiolo, La pandemia e i filosofi del parlare a vanvera, "Huffington Post" January 12, 2022
La pandemia e i filosofi del parlare a vanvera - HuffPost Italia (huffingtonpost.it)

ways. However, it seems that we are not ready to do this. The problem highlighted by Žižek is not only related to the acknowledgment of the epistemological limits of science as a form of knowledge compared to other forms of understanding of the world, but also to the ethical relationship between science and human life (in historical, political, and social terms) as well as to the capacity of science to have a positive impact on human actions, behaviors, customs, and habits. As Bondiolo states,[3] in this circumstance science is the best way to elaborate probabilistic representations of situations, as in the case of the pandemic, which are characterized by uncertainty. However, both intellectuals and common people refuse to think and talk scientifically and prefer to build upon their own beliefs and opinions.

It is very clear that within the scenario depicted by Žižek the relationship between science and human life, is often distorted and misunderstood and that this is one of the elements that contribute to the rejection of scientific

[3] Giovanni Bondiolo, La pandemia e i filosofi del parlare a vanvera, cited.

knowledge as an ethical reference. One of the reasons for this distortion is a vision of scientific knowledge as the main and absolute reference for the institutions that rule our countries. According to this vision, science is acquiring more and more power, as it is considered the basis for prescriptions that define and orient individual and collective behaviors, not offering any possible alternative choices.

One of the most relevant critics of this vision is Jürgen Habermas (quoted and discussed by Zizek) who has highlighted how the "institutionalization" of scientific and technical development has been one of the key elements that have contributed to a progressive "rationalization" of society, intending rationalization as "the extension of the areas of society subject to the criteria of rational decision."[4] This has determined the emergence and consolidation of a "technocratic consciousness" which has contributed to the "repression of ethics as a category of life" as the common positivist way of thinking "renders inert the frame of reference of interaction in ordinary language, in which

[4] Jürgen Habermas, *Technik und Wissenshaft als 'Ideologie*' (Berlin: Suhrkamp Verlag, 1968), 81.

domination and ideology both arise under conditions of distorted communication and can be reflectively detected and broken down,"[5] According to Habermas, this is not only an epistemological issue, but rather an ethical and political one since it has determined the emergence of a peculiar form of "ideology."

Stanley Aronowiz has pointed out that, in the contemporary world, science has established itself as not merely the dominant but as the "only" legitimate form of human knowledge, claiming independence from the influence of social and historical conditions. Nonetheless, the norms of science are by no means self-evident and therefore science should best be seen as a constructed discourse which legitimates its power by presenting itself as truth, an assertion which has not only epistemological but also ethical implications.[6]

[5] Ibid., 112.

[6] Stanley Arononowiz, *Science as Power: Discourse and Ideology in Modern Society* (Minneapolis: University of Minnesota Press; 1988).

As a matter of fact, the emergence and dissemination of a discourse which has legitimated the privileging of science over all other ways of knowing has led, according to Maarten Boudry and Massimo Pigliucci, to a well-developed and dangerous position maintaining the superiority of science over all other modes of human inquiry, often combined with a form of excessive confidence in the power of science, identified as "scientism." For this reason, the public discourse has been more and more controlled and dominated by the scientific discourse, with its absolute claim of upholding the truth and its prescriptive protocols based on data, evidence, and facts.

This normative reference to science has been interpreted as a form of control and oppression, which has produced, as a consequence, the refusal to know and to use scientific knowledge as a guide for individual and collective actions and practices. This is clearly visible within the "anti-vax" narrative that is based on a suspicious attitude towards science and a deep mistrust of modern medicine and pharmaceutical companies. One finds that individuals who hold such views are not only and not always emotionally

driven, but often driven by critical and independent forms of thinking.[7]

The diffusion of a "scientist" discourse has also generated fears that science may marginalize the humanities and eradicate the human subject by explaining away emotion, free will, consciousness, and the mystery of existence.[8] This vision, rooted in a Positivistic understanding of the sciences and of their function and role in society, has been strongly criticized over time from different perspectives. The sociologist and political scientist Irving Louis Horowitz has argued that the "widespread" destruction perpetrated by the technological offshoots of modern science and the ease of this destruction, performed with scientific precision, has "deepened the gulf between the extraordinary capacity of science and the everyday affairs of

[7] Lucas B. Stolle, Rohit Nalamasu, Joseph V. Pergolizzi, Jr., Giustino Varrassi, Peter Magnusson, JoAnn LeQuang, Frank Breve, The NEMA Research Group, *Facts vs Fallacy: The Anti-Vaccine Discussion Reloaded*, Adv Ther. 2020; 37(11): 4481–4490. Published online 2020 Sep 23. doi: 10.1007/s12325-020-01502-y, Fact vs Fallacy: The Anti-Vaccine Discussion Reloaded (nih.gov)

[8] Maarten Boudry and Massimo Pigliucci, eds., *Science Unlimited? The Challenges of Scientism*, (Chicago: The University of Chicago Press, 2018).

society."[9] Scientific knowledge is perceived as disconnected and separated from life itself and, for this reason, it is easily and often challenged by beliefs which are extremely powerful as they are directly connected with the living realm of practice and grounded in well-established traditions emerging from the consolidation and sharing of individual and collective experience. Accordingly, people refer to their personal beliefs or the beliefs shared within the communities which they live in (which are legitimated as reliable forms of knowledge) rather than to scientific knowledge to orient their daily behaviors, choices, and practices. Since Plato the epistemological distinction between belief and knowledge has been articulated and explored in depth. Beliefs are, indeed, mental attitudes grounded in opinions, personal testimony, and anecdotal evidence that meet some internal standards of truth, which are not equivalent to what are considered to be "scientific"

[9] Irving Louis Horowitz, "Two cultures of science**:** the limits of positivism,**"** *International Social Science Journal***,** 56, no 181 (September 2004)**:** 429–437, https://doi.org/10.1111/j.0020-8701.2004.00504.x

standards. They refer to suppositions, commitments and ideologies and therefore do not require a truth condition. Moreover, they are based on an evaluation judgment but cannot be evaluated. Finally, they refer to episodically stored material influenced by personal experiences or cultural and institutional sources, which are not discussed and problematized and as a consequence are static and not dynamic from an epistemological point of view.

On the other hand, knowledge can be described as a set of beliefs that meet scientific standards of evidence. Moreover, it refers to factual propositions and understandings that inform skillful actions, must satisfy truth conditions, is based on objective facts, can be evaluated and judged, is stored in semantic networks, and often changes in relation to new and different conditions. According to this framework, knowledge can therefore be defined as a "justified true belief" (while other forms of belief are not justified), even if this definition has been soundly problematized by Edmund L. Gettier, who used the so called

"Gettier problems" to open up a new line of discussion within the contemporary epistemological debate.[10]

At a social level, beliefs are articulated and organized into belief systems, which, according to Robert P. Abelson are characterized by seven features: non- consensuality, "existence beliefs"; alternative worlds, evaluative components, episodic material, unboundedness, and variable credences.[11] A belief system can therefore be established without the willing agreement of all the people involved in it; it is in part concerned with the existence or non-existence of certain conceptual entities (such as truth, health, and illness); it often includes representations of alternative, revolutionary, or utopian versions of the world (imagining the world as it should be); and it relies on evaluative and affective elements and combines episodic material from either personal experience or from other cultural sources. Moreover, a belief system is usually free

[10] Edmund L. Gettier "Is Justified True Belief Knowledge,?" *Analysis*, Volume 23, no 6, (June 1963): 121–123, https://doi.org/10.1093/analys/23.6.121

[11] Robert P. Abelson, "Differences Between Belief and Knowledge Systems," *Cognitive Science* 3, n. 4 (October-December 1979): 355-366, https://doi.org/10.1016/S0364-0213(79)80013-0

from boundaries since it can include an almost unlimited number of beliefs and believers, taking into account the fact that within this framework beliefs can be held with varying degrees of certitude and commitment, something which cannot happen within knowledge systems.

Within this framework, it happens that if all members of some type of group have a specific belief, they tend not to label it as a belief but as knowledge, insofar as it satisfies a condition of truth that is negotiated and agreed upon within that group. Accordingly, depending on which social community individuals belong to, they can have different views on what is considered as valid knowledge. This means that within a specific belief system it may happen that scientific data, explications, and information are not considered to be based on any valid form of knowledge, while shared beliefs within a community function better as a reliable and true reference as they are grounded in a consensual agreement which has deep cultural and social roots.

The geologist Pascal De Caprariis points out that, in order to understand why people distrust scientific

knowledge, we have to take into account their living conditions, as well as the cultural and economic forces at stake, which define specific belief systems. Within this framework, we should focus in particular on the two main belief systems which represent the foundations of thinking processes that mostly conflict with science, namely religion and capitalism, and explore the beliefs and discourses generated within these two systems to orient individual and collective practices.[12] This observation explains why belief systems have not only an epistemological function but also a practical one.

However, there are also other elements that have contributed to what the sociologist and political scientist Irving Louis Horowitz has described as a "mistrust" of science, which has become more deeply entrenched in the first years of the New Millennium. It is also true that, as pointed out by the sociologist Richard Harvey Brown, scientists themselves have contributed to a "public understanding of science" based on the acceptance of an

[12] Pascal De Caprariis, *Denying Science. Reflections on Those Who Refuse to Accept the Results of Scientific Studies*, (Bloomington: AuthorHouse, 2017).

"ideology of science" which is "impartial, heroic, and useful" and on a benign ignorance of how science actually works. This is determined by a widespread "fear that an informed public might limit the autonomy of scientists by extending their accountability beyond the scientific community." For this reason, a high level of "public understanding of science" may not be in the immediate interest of scientists.[13]

Therefore, if people distrust science, scientists do not contribute to the promotion of an effective public understanding of science, which could be the basis for the acknowledgment of a meaningful impact of scientific inquiry on social development and growth. At the moment, both within the political scene as well as within the public debate, as it is fed by the media, researchers and scientists are considered to be either expert and qualified points of reference who provide guidelines and norms for public life or as a counterpart to the political discourse. Between 1974 and 2020, as the sociologist Gordon Gauchat points out,

[13] Richard Harvey Brown. *Toward a Democratic Science: Scientific Narration and Civic Communication*. (New Haven: Yale University Press, 1998).

there has been a strong "politicization of science"[14] and a distorted and manipulative use of scientific references within the public discourse in the United States. In the context of the diffusion of the COVID-19 pandemic, this has been happening worldwide. It is useful to know that trust in science acts as a pivotal link between political ideology and attitudes to science-based measures, and this produces a depolarization of political and public debates, facilitating and supporting social change.[15] For this reason, it is necessary to understand what has produced distrust towards science and how trust in science can be recovered.

The formation of a technocratic elite of experts and scientists was advocated by the journalist Walter Lippmann in the 1920s as an achievement of the "public interest" in

[14] Gordon Gauchat, "Politicization of Science in the Public Sphere: A Study of Public Trust in the United States, 1974 to 2010," *American Sociological Review*;Volume 77, no. 2 (March 2012):167-187, doi:10.1177/0003122412438225.

[15] Justin Sulik, Ophelia Deroy, Guillaume Dezecache *et al.* Facing the pandemic with trust in science. *Humanit Soc Sci Commun* **8,** 301 (2021). https://doi.org/10.1057/s41599-021-00982-9, https://www.nature.com/articles/s41599-021-00982-9.

practice,[16] but soundly criticized by John Dewey in *The Public and its Problems* and the epistemological and educational implications of this debate, taking into account the cultural and historical context within which it emerged, have been effectively explored by Stefano Oliverio.[17] Within current political scenarios the reference to a pool of counselors who should guide political choices and public behaviors is constantly eroded, also due to the fact that, within the public arena, the so-called "experts" are asked to provide certainties and truths that they are not able to provide. This amplifies the distance between people and science, which is also at the basis of an increasing diffidence toward the aims and objectives of scientific inquiry and toward its ethical and moral implications.

[16] Walter Lippman, Public Opinion, (New York: Harcourt Brace and Company, 1922); Walter Lippman, The Phantom Public, (Piscataway, NJ: Transaction Publishers, 1925).

[17] Stefano Oliverio, *La Filosofia dell'educazione come termine medio. Letture deweyane tra politica e scienza*, (Lecce: Pensa Multimedia. 2018).

It is also evident that, as demonstrated by recent research,[18] trust in science can promote people's acceptance and approval of new rules by convincing individual minds, but has only a small, indirect effect on the effective adherence to these rules, not impacting effectively individual and collective behaviors. Moreover there are some other forms of knowledge that are acknowledged and used as alternative and more reliable than science and are the background of what Gianluca Briguglia has termed a "savant" positioning towards the world, which sustains a "dystopic" vision of the present condition and of the future seen as the scene of a medical technocracy; this is determined by an understanding of the world based on the lack of an historical method of exploration of the conditions of human life which would lead us to acknowledge the multiple possible outcomes of this situation.[19]

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[18] Justin Sulik, Ophelia Deroy, Guillaume Dezecache *et al.*, quoted.

[19] Gianluca Briguglia, L'antivaccinismo savant e il labirinto enigmistico, Post, January 10, 2022, https://www.ilpost.it/gianlucabriguglia/2022/01/10/lantivaccinismo-savant-e-il-labirinto-enigmistico/.https://www.ilpost.it/gianlucabriguglia/2022/01/10/lantivaccinismo-savant-e-il-labirinto-enigmistico/

As Horovitz points out, over time the positivist vision of science has been countered by the emergence of a "second sense of science" which "in a subtle but convincing way, has emerged among scholars leaving wide space for doubt and speculation on ultimate moral issues."[20] The acknowledgement of scientific fallibilism and the continuous tensions that engage scientific inquiry in order to find viable answers to the questions emerging within the social realm open up a new scenario, within which individuals and communities may come to trust science, understood as the matrix of shared processes of knowledge construction aimed at sustaining social development. This second sense is more consistent with a pragmatist understanding of scientific inquiry, which has its deepest roots in the Deweyan vision of the scientific spirit and of the relationship between science and society. This vision, in my opinion, can be an effective reference to reconstruct the contemporary public understanding of science, according to a different vision of the public within a democratic society,

[20] Irving Louis Horowitz, "Two Cultures of Science**:** the Limits of Positivism**,"** *International Social Science Journal* 56, no. 181 (September, 2004): 430.

and can also determine an overcoming of the separation between science and ethics highlighted by Žižek.

Dewey's Understanding of Science and Society

As Gert Biesta notes[21] "a superficial reading of Dewey's work" might "give the impression that John Dewey not only endorsed the scientific method but also seemed to believe in the worldview of modern science." On the contrary "rather than a celebration of the method and worldview of modern science, Dewey's philosophy actually amounts to a profound critique of the hegemony of modern science in contemporary life." Therefore, "rather than an argument for the superiority of scientific rationality, Dewey's philosophy can actually be seen as an attempt to develop a more encompassing and more 'humane' conception of rationality."[22]

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[21] Gert Biesta, "How to use Pragmatism Pragmatically: Suggestions for the 21st century," in John Dewey at 150: Reflections for a New Century, eds Anthony Gordon Rud, Jim Garrison, and Linda Stone (Lafayette, IN: Purdue University Press, 2009), 30-39.

[22] Biesta, "How to use pragmatism pragmatically," 31.

On the basis of the epistemological shift introduced by Dewey according to which science is no longer understood according to a positivistic paradigm but to a pragmatist one, it becomes possible to reconstruct the relationship between individuals, communities, and science focusing on the capacity that each individual and each community has not only to understand the nature of the process of scientific inquiry and its outcomes, as well as to make use of them, but also to be engaged in the process of inquiry itself. As a matter of fact, the main epistemological advance highlighted by Dewey is a clarification of the epistemic tension within the scientific inquiry, between what he termed "the quest for certainty," which is related to the expectations, fears and hopes of the individuals and the communities they live in, and the necessary acceptance of doubt, indeterminate situations, and uncertainty as constitutive elements of the process of inquiry itself, which define a new and different image of science.

This shift implies also a revision of the belief systems in which individuals and communities are embedded and of the negotiated conditions of agreement that ground the

forms of knowledge that they refer to as well as the acknowledgment of the moral implications of scientific inquiry. On his side, Richard Rorty[23] explains that the consequence of this approach is functional to the pragmatist view of a science, which "will no longer seem to tower over morality"[24] but will be a counterpart of moral imagination and hope to sustain social progress. Accordingly, as Robert E. Dewey points out,[25] the American philosopher referred to Comte as well as to Condorcet and Bacon not for their methods but "calling attention to a guiding insight shared by these authors which he inherits – the insight that science is capable of leading us to social betterment."[26]

This insight sustained the development of the idea that there is a scientific way to deal with the problems of everyday life, and that such an approach must be propagated

[23] Richard Rorty, "Dewey and Posner on Pragmatism and Moral Progress," The University of Chicago Law Review 74, no. 3 (Summer 2007): 915-927.

[24] Ibid., 920.

[25] Robert E. Dewey, *The Philosophy of John Dewey: A Critical Exposition of his Method Metaphysics and Theory of Knowledge* (Dordrecht: Springer Science, 1977).

[26] Ibid., 74.

and taught at different levels, so that society may be improved. As Larry Hickman points out, Dewey was interested both in the outcomes of scientific progress as technological tools to advance individual and collective inquiry[27] and in the method of scientific inquiry as a cognitive pattern to model individual and collective attitudes and approaches to social issues and problems. However, he did not believe that scientific progress would lead to social growth if not sustained by moral ends to be kept in view. Accordingly, for Dewey science and ethics were the complementary tools of a project of social reconstruction in a democratic perspective.

In "some stages of logical thought"[28] Dewey used democracy as a metaphor to describe the context of scientific inquiry:

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[27] Larry Hickman, *John Dewey's Pragmatic Technology*, (Bloomington: Indiana University Press. 1990).

[28] Citations of John Dewey's works are to the thirty-seven-volume critical edition published by Southern Illinois University Press under the editorship of Jo Ann Boydston. In-text citations give the series abbreviation followed by volume number and page number. For example: (LW 10,12) is page 12 of *Art as Experience*, which is published as volume 10 of *The Later Works*.

> The observable world is a democracy. The difference which makes a fact what it is, is not an exclusive distinction, but a matter of position and quantity, an affair of locality and aggregation, traits which place all facts upon the same level, since all other observable facts also possess them, and are, indeed, conjointly responsible for them. Laws are not edicts of a sovereign binding a world of subjects otherwise lawless; they are the agreements, the compacts of facts themselves, or, in the familiar language of Mill, the common attributes, the "resemblances". That is why he noted that "the emphasis of modern science upon control flows from the same source. Interest is in the new, in extension, in discovery. Inference is the advance into the unknown, the use of the established to win new worlds from the void (MW 1, 171).

Dewey here is not referring to a distinct scientific discipline, but to the vast realm of scientific inquiry encompassing both the natural as well as the social sciences. Therefore, as

Melvin Rogers argues, "the complexities of Dewey's account of inquiry emerge if we read it as a transformation of Aristotle's categories of knowledge: episteme (scientific knowledge), phronesis (practical wisdom), and techne (technical knowledge)."[29]

In the introduction to the third volume of the Middle Works, Darnell Rucker highlights the philosophical and practical importance of a "theory of inquiry broad enough and flexible enough to encompass the social, the intellectual, and the physical dimensions of the world." He also stresses the necessity to develop "theories of the aesthetic, the religious, the moral, the metaphysical that serve to integrate human experience instead of carving it up into personal and disciplinary enclaves within which men huddle to protect themselves from awareness of the real problem they fail to face" (MW 3, xii).

As a matter of fact, one of the main epistemological issues faced by Dewey is the problem of the unity of science, which is understood by the American philosopher as a

[29] Melvin Rogers, "Action and Inquiry in Dewey's Philosophy," Transactions of the Charles S. Peirce Society, 43, no 1 (2007):90-115.

"social problem." He discussed this issue in the essay "Unity of Science as a Social Problem," which he contributed to the International Encyclopedia of Unified Science, which was the Manifesto of the Unity of Science Movement organized in the late nineteen-thirties by former members of the Vienna Circle (such as Rudolf Carnap, Otto Neurath, Herbert Feigl and Philipp Frank) as well as American intellectuals and philosophers (such as Charles Morris and Ernst Nagel). Their main doctrine was that all sciences share the same language, laws, and method or at least one or two of these features (LW, 13).

This insight has contributed to a reconstruction of the human and social sciences from a new perspective which overcomes traditional boundaries, redefines the realm of the natural and social sciences, and redescribes their relationship. Indeed, Dewey was fully aware of the ethical implications of scientific inquiry and of the fact that all scientific inquiry had a meaning and a value in its relationship with human and social growth. Moreover, Dewey was convinced that also ethical issues had to be addressed using a scientific approach and scientific

methodologies. This conviction led Dewey to ask for an increasingly diffused mastery of methods, tools, and forms of knowledge, which would help individuals and societies to develop a wider awareness and understanding of the problems arising from human experience and social practices and institutions. In a famous passage of *Experience and Nature* he made this point, clarifying that:

> etymologically, "science" may signify a tested and authentic instance of knowledge. But knowledge has also a meaning more liberal and more humane. It signifies events understood, events so discriminately penetrated by thought that mind is literally at home in them. It means comprehension, or inclusive reasonable agreement. What is sometimes termed "applied" science, may then be more truly science than is what is conventionally called pure science. For it is directly concerned with not just instrumentalities, but instrumentalities at work in effecting modifications of existence on behalf of conclusions that are reflectively preferred. (LW1: 128).

The Relationship Between Democracy, Education, and Scientific Inquiry

As Metz[30] points out "according to Dewey, the scientific method is meaningless when taken apart from the continuum of 'experience.'" Therefore, it "can be interpreted only as the means by which," he "hoped to concretize his philosophy of experience within the democratic order."[31] Science is therefore viewed as an essential element to promote and sustain a democratic social organization but, as George Allan highlights, a democratic social organization is the pre-condition for the development of science. Dewey's claim, indeed "is not simply that democracy will benefit as do the sciences from a proper method of inquiry - as though democracy and the scientific method are two separate habits of intelligent action. The method used by science requires democracy, and viceversa. The skills of intelligent problem

[30] Joseph G. Metz. "Democracy and the Scientific Method in the Philosophy of John Dewey," The Review of Politics, 31, no. 2 (April 1969): 242-262.

[31] Ibid., 262.

solving are dependent on dispositions that democracies nurture and tyrannies inhibit. Conversely, without a scientifically educated citizenry, democracy is crippled. Science and democracy are each a necessary condition for the other."[32]

In "Creative Democracy: The Task Before us," which is Dewey's political and educational will and testament, he clarifies the constitutive relationship between scientific inquiry and democracy:

> democracy as compared with other ways of life is the sole way of living which believes wholeheartedly in the process of experience as end and as means; as that which is capable of generating the science which is the sole dependable authority for the direction of further experience and which releases emotions, needs and desires so as to call into being the things that have not existed in the past. For every way of life that fails in its democracy limits the contacts, the

[32] George Allan, "Playing with Worlds: John Dewey, the Habit of Experiment, and the Goods of Democracy," Soundings: An Interdisciplinary Journal 79, no3/4 (Fall/Winter 1996): 448-449.

> exchanges, the communications, the interactions by which experience is steadied while it is also enlarged and enriched. The task of this release and enrichment is one that has to be carried on day by day. Since it is one that can have no end till experience itself comes to an end, the task of democracy is forever that of the creation of a freer and more humane experience in which all share and to which all contribute. (LW 14:230).

According to Dewey, as he writes in "The Social Economical Situation and Education," a

> continued democracy of life will depend upon our own power of character and intelligence in using the resources at hand for a society which is not so much planned as planning — a society in which the constructive use of experimental method is completely naturalized. In such a national life, society itself would be a function of education, and the actual educative effect of all institutions would be in

> harmony with the professed aims of the special educational institution. (LW 8:70)

A democratic society is therefore itself educational to the extent that it is open minded, inquiring, self-correcting, and morally committed to the growth of its members. However, it can sustain itself only through the cultivation of communities within which "cooperative intelligence is steadily used on behalf of the promotion of a shared culture" (LW 8:71) a shared sense of the common good, a shared commitment to the realization of the best conditions of life and flourishing for each and everyone.

Dewey's vision opens up the possibility of educating to science through democracy and to democracy through science. This means that, on the one hand, the organization of society and of its educational system according to a democratic framework offers to each and every one the possibility of obtaining free access to the most advanced outcomes of scientific inquiry, as well as the possibility of being engaged in processes of scientific inquiry at different levels. On the other hand, a widespread exposure to

processes of scientific inquiry and a sound participation in scientific discourse for a great number of citizens sustains the development of a scientific frame of mind, which may lead to the development of high levels of "public understanding of science" as well as to an aware and sound engagement of individuals and groups in actions and practices that operationalize a reflective use of the outcomes of scientific inquiry.

Within this framework educational institutions such as school and universities may play an important role, together with the non-formal agencies that promote and sustain adult learning and are in a dialogical interplay with the cultural agents and tools that contribute to the construction of shared forms of knowledge which ground individual and collective understandings of the world. When we explore the potentialities of formal educational institutions, one of the main issues to reflect upon is which idea of science and which forms of scientific knowledge are embedded within educational curricula, and which educational approaches are used to give students access to scientific knowledge within current educational scenarios.

At the moment, the most widely recognized reference for science education worldwide is the STEM framework. The acronym STEM was introduced in 2001 by Judith Ramaley, director of the National Science Foundation's education and human resources division, in order to describe an integrated curriculum of science, technology, engineering and mathematics. While science and mathematics are critical to a "basic understanding" of the universe, engineering and technology are understood as a means for people to "interact" with the universe. Accordingly, STEM weaves those elements of human action and understanding into all aspects of education.[33] With reference to this framework, the current debate is mainly focused on the need to implement STEM within educational curricula. However, in fact, there is no evidence that the simple introduction of more scientific content, and in particular, this kind of specific scientific content, directly contributes to the development of a scientific understanding

[33] Judith A. Ramaley, Barbara M.Olds and Janice Earle, "Becoming a Learning Organization: New Directions in Science Education Research at the National Science Foundation," J*ournal of Science Education and Technology* 14, no 2 (June 2005): 173 – 189, Technology, DOI: 10.1007/s10956-005-4420-8.

of the world, according to the framework designed by Dewey.

Moreover, when Dewey referred to science he did not limit the realm of the scientific disciplines to certain specific subjects, nor did he conceive of science as a field of experience and knowledge apart from the arts and humanities. From this perspective, as David Granger points out, he may indeed be considered as a reference for those who call for the addition of the arts, in various forms, to the "modern-day quadrivium" which would therefore be identified with the acronym STEAM.[34] According to this framework, if we adopt a Deweyan perspective, educational agencies should support a reflective encounter with scientific knowledge in its broadest form, focusing on the differences between this and other forms of knowledge. Moreover, they should offer individuals the opportunity to contrast scientific knowledge with the beliefs which people are inclined to refer to within their daily experience.

[34] David Granger, "Dewey from STEM to STEAM," *Education and Culture* 32, no. 2 (2016): 1–3.

Finally, the educational encounter with scientific knowledge should be focused not so much on the access to scientific content, but as on the acquisition and interiorization of the method of scientific inquiry, which becomes an essential cognitive and metacognitive tool for each and every one. In *The Child and the Curriculum*, Dewey explains how no form of knowledge can be introduced into human life "from without" since "learning involves reaching out of the mind" and "involves organic assimilation starting from within" (MW 2, 277). This is why the access to scientific knowledge requires activation "from within" the fields of human experiences, taking into account the fact that individual and collective experience already contains within itself elements of just the same sort as those pertaining to scientific studies together with "the attitudes, the motives, and the interests" which have operated in developing and organizing scientific subject-matter" (MW 2, 278). This implies a strong involvement of the learners, starting from different fields of human experience, and a contextual exploration of the ideas, issues, and problems that have generated the construction of the different

scientific forms of knowledge, considered as the by-product of a process of inquiry, deeply embedded in those fields. Within this framework, scientific studies must be conducted on the basis of an acknowledgment of the emergence of scientific motives and interests in individual and collective life and through the enhancement of the development of scientific forms of exploration of the world around us. This process is determined by the possibility of cultivating the development of what Dewey defines as "habits," which is the key to the definition of a different understanding of science and of its role in society. We live within a texture of collective habits, which have been formed from the consolidation of individual habits that have been negotiated, organized and shared within the public sphere. This consolidation has contributed to the development of customs, intended as widespread uniformities of habit, which set the conditions for the development of individual and personal habits, contribute to the construction of social patterns and are the foundation of the ethical ideas that ground individual and collective agency. Habits incorporate purposes and socially

meaningful ideas and operate subconsciously. Moreover, people form emotional attachments to habits, which makes their modification very difficult.

In *Human Nature and Conduct* Dewey describes a habit as a "special sensitiveness or accessibility to certain classes of stimuli, standing predilections and aversions, rather than the bare recurrence of specific acts" (MW 14, 32). Therefore, a habit has cognitive and affective implications, which have strong ethical and moral consequences. Within this framework, in an educational perspective, habits are socially shaped dispositions to particular forms of activity or modes of response to the environment. They channel impulses in specified directions or toward certain outcomes and, by entrenching particular uses of means, prescribe certain specific forms of conduct in particular circumstances. For these reasons educational processes can open up new opportunities, instilling new habits or making old habits more intelligent – flexible and responsive to change. The development of habits of scientific inquiry can therefore be fully achieved through educational experiences, which lead individuals and the communities they live in to

the acquisition and interiorization of new patterns of activity, focused on the implementation and operationalization of modes of scientific inquiry within different contexts and fields. This process should go hand in hand with the widespread construction of a well-grounded public scientific understanding, to which scientists and researchers should actively contribute. In order to achieve this goal a deep revision of the forms in which scientific discourses are constructed and performed as well as of the ways in which scientific knowledge is communicated and disseminated within the public sphere is required. This revision also has deep ethical and social implications as it is strongly connected with political understanding and the use of scientific methods and tools.

In *The Public and its Problems*, Dewey highlights the risks of a public discourse for science which considers itself "an entity by itself" and not a "human construction" that can be intelligently used but is also subject to "misuse" and "abuse" (LW 2, 381). He acknowledges the political implications of "the control of science in the interest of social well being" (LW 2, 380). At the same time, he

explains that "a considerable part of the remediable evils of present life are due to the state of imbalance of scientific method with respect to its application" (LW 2, 380). This imbalance is a critical element, but it may be overcome through a "steady and systematic effort to develop that effective intelligence named scientific method" in all the fields of associated life, and particularly in the case of human transactions, taking into account "all those who are affected by the indirect consequences of those transactions," who can be identified as "the public," as well as the institutions and the "officers" that represent and defend its interests (LW 2, 246). According to this line of reasoning, the development of an effective and consistent "public scientific understanding" passes through either a redescription of the identity and role of the "public" within contemporary political and social scenarios (taking into account the agents that organize it and make it effective) or a widespread use of a scientific method applied to all the circumstances of human life. Noah Weet Feinstein shows how these suggestions may be elaborated according to the definition of the "public sphere" used by Jurgen Habermas and identifies

the opportunity of a "collective engagement with science" not through the cultivation of scientifically literate individuals, but through the involvement of various kinds of "productive communities" in the scientific exploration of matters of public concern.[35]

However, if we believe that the cultivation of this kind of community can be an effective tool for science education we should, Feinstein points out, pay particular attention to a series of conditions and pre-conditions: the first condition is that we should be aware that, in the construction of the scientific discourse and in the development of a "public sphere," it is necessary to acknowledge the existence of prior knowledge and to consider also the "non-scientific frames and narratives that people use to interpret news about science" (Feinstein, 2015); the second condition is to reflect on the possibility that within the public sphere scientific dispositions and practices can be effectively interwoven with requirements,

[35] Noah Weet Feinstein," Education, communication, and science in the public sphere," *Journal of Research in Science Teaching*, Issue 52, no 2 (January 2015): 145-16, **https://doi.org/10.1002/tea.21192**

dispositions and practices of critical citizenship, taking into account that citizens must learn to work directly not only with scientific data and facts, but also with what Feinstein defines "the second shaping of scientific facts," making use of available (imperfect) sources of scientific knowledge (such as the stories provided by the news media), being aware that "no source of science information is truly neutral"; the third condition is the exploration of the potentialities of the use of "new and creative platforms for public engagement" which can be useful in the creation of networks and forms of agency useful to promote the dissemination of habits of scientific thinking and of scientific communication and dissemination. The cultivation and dissemination of "productive communities" can be implemented either within formal or non-formal and informal contexts, and may work as a model to sustain the development of a new shared public understanding of the nature and function of science in society. However, this requires also a real and effective commitment on the part of scientists and researchers, who should be engaged not as static references and providers of absolute certainties and

truths, but rather as testimonials of the complex articulation of scientific inquiry, which, according to a pragmatist understanding, is nourished and sustained by uncertainty, and also as cultural animators and educational agents, at the service of a wide process of social change and development.

Concluding Remark

As Larry Hickman points out, in a Deweyan perspective science may provide successful models of control and direction of human affairs, but cannot be used as a tool in the hands of a technocratic elite to manage human actions and behaviors according to a "top down" perspective. On the contrary, according to Dewey "social control is neither top down nor bottom up" and from a political point of view "it is neither narrowly authoritarian nor mindlessly populist"; in this perspective, science should be considered a useful device taking into account its capacity to sustain the development of a method of social control useful for "the dissemination of power on the basis of the ability to employ

it in ways that are broadly beneficial"[36] which requires a strong educational effort.

[36] Larry Hickman, "Socialization, Social Efficiency, and Social Control: Putting Pragmatism to Work," in *John Dewey and Our Educational Prospect: a Critical Engagement with Dewey's Democracy and Education*, ed. David T. Hansen (Albany: University of New York Press, 2006), 67-81.