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Francis Bacon's Thought**

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Philosophy, Science and Education in Francis Bacon's Thought

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Abstract

This article has as main objective to make a concise approach about Francis Bacon's (1561-1626) thought, dimensioning it inside educational area. It will be done a summary explanation of his historical context (Renaissance), of some of his works and of some of the main topics of his philosophy, demonstrating its applicability to pedagogy. By developing a conceptual and contextual approach, this study has adopted as its theoretical-methodological reference the historical-dialectical materialism, according to Lucien Goldmann (1913-1970), appointing as main result the alert done by Bacon in relation to knowledge usefulness in order to improve human being's lifetime, this knowledge that, identifying itself to power, it allows to mankind to dominate natural world and, equally, to itself, wining, so, its own weakness and limitations, because its own ignorance is the root of the evils of which suffer, as well as the material and spiritual difficulties in the presence of which it founds itself, reason for which education, by adopting that conception as one of its foundation, there will be thought and practiced in a way to be aware to the responsibility that knowledge brings with itself.

Keywords: Education, Francis Bacon, Philosophy, Science

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Introduction

This text has as its objective to deal with, summarily, the thought of the English philosopher Francis Bacon (1561-1626), appointing, simultaneously, its convergences to educational field. In order to make it happen, here it will be followed this route: firstly, a summary explanation will be done about historical context in which Bacon is found, that is: Renaissance; secondly, some of the main topics of his philosophy will be joined, from which considerations of educational order will be done. The reason of this approach is based on theoretical-methodological reference selected to elaboration of the present research, that is, historical-dialectical materialism, according to Lucien Goldmann (1913-1970), who weighs up:

Thought is only a partial aspect of a little abstract reality: alive and whole man. And this, on the other hand, is only an element of the ensemble that is the social group. An idea, an work just receives its true meaning when it is enrolled to the ensemble of a life and of a behavior. Beyond it, it often happens that the behavior that allows to understand the work is not the author's, but of a social group (to which the author may not belong) and above all, when it deals with important works, the behavior of a social class (GOLDMANN, 1967, p. 7; our English version).

The reason for choosing the Bacon's philosophy rests on the importance of a scientific training such as an essential element to intellectual improvement of human being, because sciences constitute, together, an indispensable factor to clarify reality by human being; however, a scientific education also requires a way in order to conceive what one defines such as science, because it will allow to divide what science is from what is not it, as well as it will permit to establish what genuine is and what is not it, one considering what must be chosen like an object of scientific approach.

Once Bacon has been become one of the main disseminators of modern science conception, it is possible to extract from his thought categories which allow to discuss about scientific knowledge nature, clarifying, thus, its principles, methods, objectives or finalities, as well as its extension, reach or limit and, consequently, to discuss education under this perspective.

Although Bacon should not be considered, *stricto sensu*, an education theorist, considering that his work in general does not deal with the pedagogic problematic in particular, it does not mean that from his thought one should not be allowed to take educative characters conclusions off, considering that the solid presence of the sciences into education (overall into contemporary education), supposes a foundation and a legitimation, which ones an approach about Bacon's epistemology would have conditions for clarifying. Moreover, Bacon, especially into one of his *Essays*, (whose title is *Of Studies*) reveals how much he believes in the power of education, process in which studies are

indispensable: “*Abeunt studia in mores. Nay, there is no stound or impediment in the wit, but may be wrought out by fit studies*” (BACON, 2013).

A Short Historical Contextualization of Francis Bacon

In order to make a historical context of Francis Bacon’s life, work and thought, one needs to report to period named Renaissance, once both his life and his work are tributary to it, framing, thus, to paradigms structured by that cultural movement which had proposed to itself, among other goals, to restore the spirit of progress of human knowledge, freeing it from the bonds which the religious Jewish-Christian tradition had imposed to it, to whom some truths had already been established, reason by which there would not be need of looking them for, nor questioning them.

That dogmatic posture from the part of the mentality of medieval origin maintained thanks to predominance of scholasticism, to whom theology of that age subordinated to itself all the rest branches of knowledge, these are: philosophy, sciences and arts. It urged, thus, to rebel against that tradition, which prevented the knowledge advance. Thus, imbued of the knowledge rectification spirit, characteristic of Renaissance, Bacon’s philosophy will do chorus in favor of arguing that:

Human spirit errs among chimeras; it needs to do a shallow board of ancient doctrines, to do a critical balance of knowledge, to put in evidence what it contains of inherent mistakes to human nature and from that to indicate the true way, a method as the condition of possibility of a new science (HUISMAN, 2004, p. 106; our English version).

Breaking the Jewish-Christian medieval scholastic tradition, the renascent will propose new paradigms, which ones will be based on a new way of conceiving reality in general and man in particular, who would turn to be its center and, so, everything would turn to be thought under human being optic, as much into his rationality, as much into his temporality, that is, in the Renaissance, man saw himself as a rational being and, thus, he turned to rely on his rationality as the instrument of his own spiritual and material emancipation¹; however, that rationality became more linked to experience, without which reason, abandoned to itself, would throw itself into deep abysses

¹For meaning Renaissance a historical phenomenon in which the European mind not only realized but also intensified its own innovator power, ones verifies that:

the own idea of Renaissance can only be comprehended into its true meaning if we obtain to fathom that movement of recapture which results in the creation of something new; that movement, which, on the other side, it is made possible by a consciousness taking about itself (AZAR FILHO, 1999, p. 10; our English version).

from which perhaps it would never escape; thus, experience, reason touchstone, it would be considered as the indubitable criterion of inquiry for knowledge consolidation. Therefore, according Cassirer advocates:

Experience does not constitute the opposition and the opposite pole to fundamental force of theoretical knowledge anymore, to scientific reason; it represents, that is, its way for excellence, its action field and its confirmation (CASSIRER, 2001, p. 279; our English version).

Some Main Topics of Bacon's Philosophical Thought

The two main philosophical works written by Saint Alban Viscount (*Instauratio Magna Scientiarum* and *Novum Organum Scientiarum*) traverse about contents which constitute records of researches of epistemological and methodological characteristics, whose aim was to start from the state in which philosophical and scientific knowledge found itself in his age and, thereafter, to elaborate its critical revision, in order to promote, thus, a true knowledge reformation, both in its formal and material aspects. As its result, Bacon: “gave a new order to sciences, he proposed distinction between reason and faith in order to not falling into religious prejudices which distort comprehension of reality” (GADOTTI, 2005, p. 76; our English version).

Bacon longed, thus, to overcome and substitute scholasticism paradigms, present as far as, because they did not philosophically and scientifically propitiate to mankind necessary knowledge to effective nature dominion, reason by which it was needed to find another way (method) to production of a kind of knowledge which were, overall, profitable to mankind, considering new historic requirements brought by Renaissance culture. In the *New Organon*, aphorism XVIII, Bacon summarizes his thought in relation to knowledge in his age:

The discoveries which have hitherto been made in the sciences are such as lie close to vulgar notions, scarcely beneath the surface. In order to penetrate into the inner and further recesses of nature, it is necessary that both notions and axioms be derived from things by a more sure and guarded way, and that a method of intellectual operation be introduced altogether better and more certain (BACON, 2013).

The *Instauratio* general plan is well clear: inside, there is the propose of a new standard for reformation and construction of knowledge, whose process, initially, should start from investigation of concrete and particular facts in order to, then, one might look for abstracter and more general laws which could explain them and, finally, one might arrive to the most general principles (laws), with which one might, consequently, to return to the facts in order to

interfere in them; this is, summarily, the configuration of Bacon's inductive method, which hereinafter would be shown like the conductor of the modern philosophy and science. Behold as the aphorism XIX of the *Novum Organum* describes the profile of this inductive reasoning:

There are and can be only two ways of searching into and discovering truth. The one flies from the senses and particulars to the most general axioms, and from these principles, the truth of which it takes for settled and immovable, proceeds to judgment and to the discovery of middle axioms. And this way is now in fashion. The other derives axioms from the senses and particulars, rising by a gradual and unbroken ascent, so that it arrives at the most general axioms last of all. This is the true way, but as yet untried (BACON, 2013).

With the description of his inductive method, the Baron of Verulam lays the foundations for the consolidation of the empiricism, which, together with the rationalism, it will disput, from then on, the dominion of intellectual philosophical and scientific scenario in Western Civilization. In synthesis, we can say that:

The Instauratio magna scientiarum should have precisely represented the reform of know, should have been the summa philosophica of the new times, and launched the foundation of regnum hominis, so boldly started by science and policy of the Renaissance. This work should have embraced the encyclopedia of science and also covered the techniques, according to the new ideal human, practical and immanentist (PADOVANI & CASTAGNOLA, 1978, p, 316; our English version).

CONVINCED THAT THE KNOWLEDGE IS A SECURE INSTRUMENT FOR THE DOMINION OF NATURE, BACON SUGGESTS THAT THE SAME NEEDS TO BE CLASSIFIED (OR, BETTER, RECLASSIFIED), BASED ON HUMAN FACULTIES THAT ENGENDER IT. THIS CLASSIFICATION, PROPOSED BY BACON, FOUNDED NOT MORE ON THE OBJECT, BUT RATHER ON THE SUBJECT OF KNOWLEDGE, WHICH WAS SCHEMATIZED ACCORDING TO THE MANNER WHICH FOLLOWS, IN PEDAGOGICAL TERMS, IT IS A GUIDE OR A CURRICULUM FOR THE TEACHING OF METHODICAL AND SYSTEMIZED KNOWLEDGE:

- Poetry - knowledge drawn up by the experience of fantasy or imagination;
- History - knowledge drawn up by the experience of memory; it is subdivided into:

- ◆ History Natural - record of events of the physical world over time and space;
- ◆ History Civil - record of events of the human world, that is, of civilizations, in the course of their times and places;
- Philosophy - knowledge drawn up by the experience of reason; it is subdivided into:
 - ◆ First Philosophy (*Philosophia Prima*) - study of the principles common to the various sciences;
 - ◆ Natural Theology - rational knowledge of God, or *Teodiceia*);
 - ◆ Science of Man - it is a kind of Philosophical Anthropology, because it deals with the rational knowledge of the human being; it bifurcates into:
 - Philosophy of Humanity (*Philosophia Humanitatis*) - science of individual man, that is, the study of the physical and mental structure of the human being, something like a *Psychology* or *Human Physiology*;
 - Civil Philosophy (*Philosophia Civilis*) - science of human society, that is, study with respect to the art of governing, as well as to relations and human affairs;
 - ◆ Natural Philosophy or Physics (rational knowledge of nature), which, in its turn, is divided into:
 - Speculative Physics – study of the first natural causes; it bifurcates into:
 - Special Physics – study of the material and efficient causes;
 - Metaphysics – study of the formal and final causes;
 - Physical Operational - study of mechanical arts.

Once upon a time setting the classification of knowledge, made in the first part of the *Instauratio*, Bacon will do, in the second part of his ambitious unfinished project, investigations that go to consolidate the foundations for the realization of the science of nature (physics), in which he had a specific interest. Thus, he occupies himself, in *Novum Organum*, about justifying the principles which, in their turn, will sustain the method of which natural philosophy will serve itself, method that is none other than the inductive method:

Novum Organum is perhaps the most important book of Bacon and essentially consists of an appeal for the adoption of the empirical method of questioning. The practice to be based completely on deductive logic of Aristotle was not reliable, and a new method of questioning, the inductive, became necessary. Knowledge is not something with which to begin in order to deduct conclusions from it; it is, in reality, something that finally one reaches. To understand the world, it should be before observed. First one should collect the facts, said Bacon, and then take the conclusions of these facts by means of inductive reasoning. Although scientists have followed closely the inductive method of Bacon, the general idea in it printed - the crucial importance of observation and experimentation – it is the marrow of the scientific method since then (Hart, 2001, p, 503; our English version).

In this way, the Lord of Verulam found that induction was needed to acquire greater scientific prestige, because the aristotelian-thomistic scholastic tradition had prioritized the deduction (syllogism), relegating the induction to a lower level; opposed to such a tradition, Bacon claims the induction as the true scientific method, delegating, therefore, the deduction only the logical conclusions of induction.

As it is known, Bacon claims, against Aristotle and scholasticism, the inductive method. Aristotle and Thomas Aquinas clearly stated this method, and until they recognized it as the only initial procedure of human knowledge; however, they was interested much more in the causes than in the experience, which transcend the experience instead of the own experience; much more in the metaphysics than in science (PADOVANI & CASTAGNOLA, 1978, p, 317; our English version).

The Bacon's induction contemplates a negative part and another positive; in the first, it is to remove from the mind the obstacles which stand in the way of the knowledge of the truth; in the second, its scope is to build real models for the interpretation of nature. With that, it is noted that the inductive method here proposed bifurcates into two approaches, these that will be here named like this way: the first part, named 'the criticism of the idols'; the second part, 'the boards of discovery or research'. Moreover:

The vision of Bacon of the scientific method was, essentially: experimental, qualitative and of inductive nature. Such as the paracelsists, he surmised mathematics. If he stated that the investigation of nature was more well conducted through the application of mathematics to physics, he also complained that it could be used in excess and, in fact, he felt that the mathematicians

began - incorrectly - to dominate the subject (DEBUS, 2002, p 102; our English version).

According to Bacon, such methodological steps constitute, together, the safe guidance by which the intellect or the human mind must be guided to achieve the appropriation of reality, because:

The understanding left to itself, in a sober, patient, and grave mind, especially if it be not hindered by received doctrines, tries a little that other way, which is the right one, but with little progress, since the understanding, unless directed and assisted, is a thing unequal, and quite unfit to contend with the obscurity of things (BACON, 2013).

The Criticism of the Idols

Bacon was convinced that the route for the preparation of a solid and secure philosophical and scientific knowledge required, in the first instance, the removal of some of the barriers that the human mind would have to take itself off in order to, once free of them, it would be able to launch itself to the reform and the construction of the true knowledge; such obstacles are by him named ‘*idola*’, i.e. ‘*idols*’. The term is of Greek origin (*ειδολον*) and means: ‘*image*’; biblically, it is a word used to refer to false deities, that is, to the pagan gods, rejected by Judaism and Christianity, which are monotheistic religions; thus, Bacon makes use of such meaning, applying it to the errors, illusions or deceptions into which the human intellect is susceptible to incur, reason by which it is urgent to get extricated them off, because:

The idols and false notions which are now in possession of the human understanding, and have taken deep root therein, not only so beset men's minds that truth can hardly find entrance, but even after entrance is obtained, they will again in the very instauration of the sciences meet and trouble us, unless men being forewarned of the danger fortify themselves as far as may be against their assaults (BACON, 2013).

In the catalog of Bacon, idols may be of four species, namely:

- 1) Idols of the Tribe (*Idola Tribus*) – errors caused by the limitations of the own human species, being, therefore, inherent in it, that is, this is a natural propensity to error, to which the education both can combat and mitigate as perpetuate and expand, despite not being the origin of them.
- 2) Idols of the Cave (*Idola Specus*) – errors caused by intrinsic limitations of the human individual, who lives, in principle, such as

inside a cave, obscure and confusing; it is an allusion to the allegory of the cave of Plato (428/7-348/7 BC), according to which the human condition in this world is similar to that of a prisoner inside of a cave; on the contrary of the idols of the tribe, such idols can have education for one of their causes.

- 3) Idols of the Market Place (*Idola Fori*) – once upon a time that human beings are human beings who interact, they live such as in a huge market or square; thus, deceptions arising from contacts or relationships that they establish among themselves become, as soon as, unavoidable, because the imperfections and the bad use of language, instrument of their interaction, divert them of the access to the truth, reason by which education, by being an interactive activity that makes use of the language to carry itself out, it is not exempt from being a focus of such types of idols.
- 4) Idols of the Theater (*Idola Theatri*) – illusions awakened by philosophical and/or scientific theories or teachings, which generate authority for themselves and, consequently, lead to the submission; as they are not free from errors, cause a false understanding of reality, leading to a staging of the truth, rather than revealing the truth itself, becoming, thus, purely and simply inventions, such as in a piece of theater; for this reason, it appears that education, that invariably works with many theories, it is susceptible of being contaminated by misunderstandings into which such doctrines may incur.

The denunciation of the idols is a warning in order to appoint the necessity of being attentive to the real and possible failures which are subject to those whose minds are dedicated to the pursuit of knowledge of the truth, reason by which the intellectual activity does not only involve the production of knowledge, but also the observation of what does not represent the true knowledge, as well as it concerns to correction or deletion of false or invalid knowledge. Education, designed in such a context, can act both in favor and against the intellectual emancipation human, because it is an activity that, by shaping human spirit, it can, at the same time, send it to both the truth and the virtue as to the falsehood and the vice. Thus, an educational project designed according to the Bacon's parameters would contemplate, concomitantly, a methodical, systematic and effective work for the awareness in relation to idols and a relentless fight against them, since they are the upholders of the ignorance of humanity.

The boards of discovery or research

After discussing about the negative part of his inductive method, in its positive part Bacon strives to build from the records of the observations of the natural, concrete and particular facts, extracted from the experience, tables that

enable him to move from effects to causes, from phenomena to essences of things. The preparation of such tables has a very clear and precise goal: to reach the wording of abstract and universal laws which govern the phenomena or the effects observed in the natural world, because true knowledge consists exactly of the appropriation of the variants and the constant recorded from the experiences made, i.e., the boards allow the investigator to extract from the empirical contingency the logic necessity of the structure and of the operation of nature, which means to move from ‘natures’ (effects or phenomena) to ‘forms’ (causes or essences); in other words:

The natures are precisely the experimental phenomena, object of special physics (light, heat, weight, etc.); the forms are generic laws and organizing of natures, essences or formal causes, objects of Bacon’s metaphysics (PADOVANI & CASTAGNOLA, 1978, p, 317; our English version).

Thanks to the boards of discovery or research, it also allows to distinguish ‘spontaneous experience’, of common sense own, from ‘controlled experience’, which is the ‘experiment’, the scientific experience *par excellence*, because:

But the best demonstration by far is experience, if it goes not beyond the actual experiment. For if it be transferred to other cases which are deemed similar, unless such transfer be made by a just and orderly process, it is a fallacious thing (BACON, 2013).

This, in turn, is what in which the researcher has a specific interest, since it is his instrument of production of science. Bacon classifies the experiments into two categories, which are:

- a) Experiments of Light (*Experimenta Lucifera*) – they are suitable for clarifying universal issues of philosophical-scientific order; for example: when one responds why some metals are more malleable than others; for that reason, they are the scientific experiments *par excellence*, because they bring to the human intellect knowledge by causes;
- b) Experiments of Fruit (*Experimenta Fructiferorum*) – they are those that lead to tangible or practical results; individual ones, therefore; for example: why is aluminum a more appropriate metal to build domestic utensils than tin; for that reason, they are experiments of scientific-technical order.

Experiments, both of light and of fruit, once upon a time made, are, therefore, registered on the tablets of discovery or research; such tables, despite their scientific value may be somewhat obsolete or outdated for the current days, they have, on the other hand, a unquestionable pedagogical value,

because they show that the experiment will only have usefulness to man if it is properly registered and systemized for future consultations, not being lost, therefore, the work dedicated to the pursuit of knowledge of the truth of nature.

On this way, a scientific education requires the methodological work of assignment of the experiments carried out, in order to expand and deepen the human knowledge, not deviating it from the path of progress or improvement. Thus, a science, as much to be taught as much to be learned, requires a methodical and systematic training, which means that it is a modality of knowledge which presupposes, as much from the part of the educator, as much from the part of the student: responsibility, discipline and seriousness; considering the easiness which the human mind has to deviate itself from the path of truth, which has been demonstrated with the exposure of the criticism of the idols.

Conclusions

In spite of Bacon has not been able to make happen, in full, his intention to compose an epistemological encyclopedia which were able to grant to philosophy and science the foundation and the legitimacy needed in order to become themselves ways of knowledge targeted by the search of truth and the consequent human ownership of the physical world, there is, however, that the western civilization owes him the merit of having been one of the main thinkers who make up the chorus of those who gave themselves the task of systematizing the human knowledge, giving it, simultaneously, an appropriate methodology to appropriation of reality by man.

In addition to the elaboration of a philosophical-scientific systematic and methodology, Bacon is also responsible for establishing the primacy of the subject of knowledge in relation to its object, once his epistemology was designed from the 'cognoscenti one' (subject of knowledge) and not from the 'cognoscible one' (object of knowledge), which is verified by considering the classification of knowledge proposed by him, which was performed by having as primary criterion the faculties of which has the cognoscenti subject to represent to itself the cognoscible object.

In relation to the applicability of Bacon's thought to pedagogy, one should note that it is possible to do, considering the following aspects:

- 1) His philosophy alert to the risk of errors in which incurs the human mind when it comes to produce true knowledge, those risks placed under the metaphor of the idols; thus, it is up to both educators and learners take precaution against such dangers, by making every and any efforts that result in combat, on the bypass, in the mitigation and the eradication of these obstacles that prevent the human intellectual refinement;

- 2) By proposing a classification of knowledge founded on human cognitive faculties, Bacon puts the subject of knowledge into the center of the production of knowledge, appointing to him/her, thus, the responsibility for his/her own knowledge, which means, in pedagogical terms, that the individual becomes, in this perspective, the main responsible for his/her intellectual autonomy, and should, therefore, become the driver of his/her own learning, which is the key to his/her own emancipation;
- 3) The Bacon's inductive method is a laborious proposal, but safer, concerning building knowledge, because it is based on the experience, which, in turn, must be organized in a way that it will give the researcher access to reality and not the immersion in falsehood, by following the path of observation and not by expanding the path of imagination, since the distinction made by Bacon between science and poetry reveals that this is a knowledge founded in facts (and, therefore, totally committed to the reality on the way it is) and this is a knowledge based on chimeras (that means to say that poetry does not have, necessarily, compromise with the observation of reality, being more an imaginary elaboration of that one); pedagogically, this can be exploited on regarding the distinction between what really exists (object of scientific studies) and what imaginarily exists (object of poetic elaborations), or in other words, a scientific education is founded on what is observed or if one perceives and a poetic education is founded on what one can imagine or feel.

The study undertaken here about some aspects of Bacon's thought points as its main result the alert done by Bacon in relation to the usefulness of knowledge for the improvement of a human being life, knowledge this that, by identifying itself with the power, allows the humanity to dominate the natural world and, also, to itself, winning, therefore, its own weaknesses and limitations, because its own ignorance is the root of the evils which afflict it, as well as ignorance is the cause of the material and spiritual difficulties in front of which mankind stands, it is because if education, having such a concept as one of its foundations, so there is that one needs both to think and to practice it in order to draw awareness to the responsibility that knowledge brings; because:

Human knowledge and human power meet in one; for where the cause is not known the effect cannot be produced. Nature to be commanded must be obeyed; and that which in contemplation is as the cause is in operation as the rule" (BACON, 2013).

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