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Methods and Cognitive Modelling in the History and Philosophy of Science-&-Education

Knowledge within Anxiety

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Abstract:

Modern epistemology is in the peculiar position of retaining its trust in man's ability to acquire knowledge without being capable of specifying the reasons for our gnosis success. Popper was the first to state that any conclusion concerning the possibility or impossibility of knowing is a transcendental statement and he states, also, that man reaches knowledge while trying to guess. In my opinion, we know things because we assume to have always been aware of them, in the sense that some form of immediate awareness has promptly enabled us to perceive them, identify them, use them. But one needs to ascertain whether the reason is the most suitable faculty to ensure the positive development of knowledge. At last, Kuhn claims the impossibility of comparing different theories. But if we establish a comparison between theories in terms of their complexity, then we must admit that there occurs some progress.

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The Reasons for the Success of Knowledge

Modern epistemology is in the peculiar position of retaining its trust in man's ability to acquire knowledge without being capable of specifying what role reason plays with reference to the other faculties, that is without fully explaining the reasons for our gnosis success.

Popper (Popper 1972) was the first to state that any conclusion concerning the possibility or impossibility of knowing is a transcendental statement and, echoing Kant (Kant 1986), he states that man reaches knowledge while trying to guess.

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That does not prevent Popper from trusting man's rationality, though with a peculiar view which allows him to have "irrational faith in the reasonable attitude" (Popper 1972, 605). He adds, also, that "empirical knowledge", including "scientific knowledge", "consists in guessing attempts, and that many such attempts are unlikely (that is their probability in succeeding equals zero), though they may be well corroborated" (Popper 1995, 412-413).

Henceforth, the provision whereby "the phenomenon of knowledge is doubtless the greatest miracle in the universe" (Popper 1975, 17) does not stop Popper from retaining faith in it, though such faith is supported by rational methodology.

Lakatos goes even further, prompting Popper into using "conjectural metaphysics linking corroboration to likelihood", in order to include "an inductive conjectural principle" "within rationality" (Lakatos 1996, 204). However, also in this case, the problem of distinguishing between what is rational and what is irrational is still crucial, regardless of the specific assessment criteria one wishes to use. The issue needs to be addressed if we want to explain why our cognitive activity is successful. Lakatos does not wish to elude the issue, nonetheless, he finds Popper's "positive solution" inadequate (Lakatos 1996, 218). So, if Popper states that "we can justify the choice of certain theories in light of their corroboration, namely in light of the present state of the rational discussion over rival theories in terms of their likelihood", in Lakatos's opinion this analytic principle should be coupled with a synthetic one "providing estimates of likelihood" (Lakatos 1996, 216).

Also Kuhn considers "impenetrable" the manner in which the individual manages to produce a paradigm and a method to "organize the collected data" (Kuhn 1995, 117), whilst not doubting that it does happen.

On the other hand, Feyerabend urges to consider the play between the sources of knowledge and advises us "to be rational without making the mistake of believing that man could and should improve himself only through rational planning" (Feyerabend 1973, 142).

Consequently, it is no surprise that, when Popper rightly points to the need to dismantle "the idol of certainty", on the grounds that "it hinders not only the boldness of our issues, but also the rigour of our check-up tests" (Popper 1995, 311), in the eyes of later epistemologists, such need seems to contradict Popper's recurrent trust in man's reasonableness and in scientific progress, as it does not clarify the limitations and the role of reason, leaving knowledge without valid foundations.

Lakatos's methodological perplexities (Lakatos 1996) thus turn into a clear request for a new type of anthropology on the part of Feyerabend, who believes the rational-critical approach is debilitating, given that "theory appears to suffocate imagination and to drain all sources of speculation" (Feyerabend 1973, 93-94). It is essential to counter this unilaterally rational conception of the man with alternative activities, such as playing, summoning the whole of man, including his feelings.

Owing to such diverse positions, there is the need for an analysis of the foundations of knowledge, namely of the reasons why we are so successful in our cognitive activity, in light of the fact that none of the mentioned authors has cast doubts that science does, indeed, reach some form of success. If success is reached, then it should be possible to identify and appraise that success.

Popper wonders why we use "transcendental universal laws" and answers it is due to two reasons: a) "because we need to", as there is no "pure experience"; b) because "a theoretician is a man who wishes to explain experiences" (Popper 1995, 481). In line with Popper's words, we too can say that we are successful because we need to of it and that we find explanations because we wish to and we can explain.

The issue is linked to the relation between man and novelty.

In my opinion, novelty exists because we trust our ability to understand what is new, hence it is really new only when it is accepted and it is considered at some stage controllable by man, that is when we reduce it to a problem manageable by man. Of course, such trust would be faith or free will if during the history of each one and of mankind it had not proven itself effective. In particular, we start from the assumption that between man and the world

there is a potential relationship, and, in any case, we constantly find that the world stands as a usable set for man. Such relation and usage consequently imply there is a human ability besides the practical one, namely a theoretical one. Being and cohabiting with the world is a need we have, it is necessary for our survival, hence we need success. Nonetheless, the number and quality of successful cognitive instances rely on man's willingness to have an open attitude, an attitude that shows itself as a tendency to establish the greatest number of possible relationships.

The same trust underpinning success exists in relation to knowledge, to our ability to know too.

Once again, we can say: we know things because we assume to have always been aware of them, in the sense that some form of immediate awareness has promptly enabled us to perceive them, identify them, use them. Moreover, that assumption is not totally unsound, given that man possesses faculties such as intuition, understanding and formal logic, which identify with things and take possession of them. Basically, man improves and distinguishes the faculties he possesses, partly and wholly for genetic reasons, through constant practice involving his surroundings.

As a consequence, man did not wonder from the outset (nor do it children) whether he would succeed or not in knowing the world; he operates in the world and knows it (or thinks he knows it).

From man's point of view, rationality is something a priori which finds an explanation in the need to establish relations with the world. The logical and conceptual tools man's gradually acquired will allow our world knowledge to reach increasingly deeper results, yet this is not a mechanical and automatic process; the degree of results also depends on man's level of decisiveness and perseverance. Beyond subsistence, knowledge is an extravagance and man decide he can afford it. However, also in the case of theoretical knowledge, trust in itself, assumed in an a priori manner, persists and is strengthened only because it proves to be effective, actual, checkable. After all, man is aware of his life continuity and hence he can verify how adequate his mental and physical resources are, including his cognitive ones.

In addition, man goes from the need for stability and that for innovation; such dialectic is at the base of any cognitive development.

The Role of Reason

However, at this point, one needs to ascertain whether the reason is the most suitable faculty to ensure the positive development of knowledge and, should that be the case, one needs to understand what role and what place we assign to reason.

Feyerabend (Feyerabend 1973) advises us to consider man in his wholeness and to recognize what contribution the other faculties can offer, even from the point of view of knowledge. In principle, such advice is appropriate and fair and should be welcomed. But, one should dispel the prejudice whereby reason is itself self-sufficient or, even worse, it deliberately excludes the intervention of other faculties. In fact, in order to relate to the world, at least initially, reason must necessarily rely on the other human faculties. For example, it may persistently and accurately repeat an action only if it is supported by will; yet again it may establish a wider range of relations with the world only if it is supported by an exploratory inclination, that will soon turn into desire; or it engages in tasks that are not urgent and not promptly useful because potential success procures it delight and self-complacency. The suffocating of all these psychological relationships is, thus, a decision on man's part, that in no way complies with the ordinary course of reason.

Overall, reason has a partial position within the whole of human actions, as not everything is performed reasonably or consciously, and, indeed, many actions are a consequence of pre-conscious, unconscious and subconscious aptitudes.

Nevertheless, in Lakatos's words, "the man who demarcates is willing to recognize that expressed knowledge is only the tip of an iceberg, yet it is precisely in this small, emerging tip of human activity that rationality lies" (Lakatos 1996, 290).

Moreover, Laudan (Laudan 1979) says that, alongside J. S. Mill, we may agree that knowledge must not aim at completeness. However, the knowledge does follow such an approach, thus, it must be consciously supported.

Given such aporia, then what is man's basic task?

It seems to be reaching the truth and, indeed, man always aims at universal knowledge and even when he does not aim at it deliberately, he inevitably gives his knowledge such universal meaning. However, man soon finds out the illusory nature of his ambition and the failure, which is more or less partial, directs all attention on to man, posing crucial questions on his fallibility, on the motivations of such fallibility, on the nature and conditions that determine mistakes, on the possible psychological and cognitive remedies, on man's real abilities. Truth, taken as a conscious scope, then turns into an ideal or a transcendent entity that may have both a metaphysical and scientific foundation.

In fact, the truth is an outcome suiting man's convictions and his level of world knowledge. In order to this, cognitive methods and logic account for the adequacy of knowledge so far reached.

In general, we aim at acquiring a sufficient and plausible explanation of phenomena in such a way that they are controllable and culturally objective.

Henceforth, if these are overall the place and the role of reason, then one must establish what is meant by adequate, plausible and suitable knowledge.

The basic problem with knowledge, in terms of the correspondence between a theory or a notion and experience, is that put forward by Kant (Kant 1986), namely whether it is possible to reach some form of knowledge or notion capable of including in itself all the countless, potential instances offered by experience. Having assumed that the total task cannot be fulfilled, we must explore under which conditions knowledge may be considered rational, that is linked to known and foreseeable experiences and linked to them in a non-arbitrary manner.

Man is endowed with theoretical thinking, namely of thought that to some extent is abstract and unrelated to the world. As Lakatos (Lakatos 1996) and Kuhn (Kuhn 1995) state, by means of theoretical thinking, facts are given an interpretation even before being observed. Nevertheless, it is also true that the basic feature of human thought is that of endowing itself with twofold methods and principles; in that case, theoretical thinking is coupled with intuitive and empirical thinking. Any unilateral approach is excessive and sooner or later it either prompts or reactivates the opposing principle, which acts as a balancing element. The best thing is to establish an accurate dialectic method between opposing principles. This attempt pertains to self-awareness.

It is a fact that man is capable of both theoretical and empirical thinking, and deductive and inductive logic, and so on. Therefore, it is impossible to ascertain absolutely whether theory comes before facts or vice versa, or whether thought must necessarily be prompted by experience or it may give a meaning to experience, bringing it somehow to life. The two processes are both possible and are alternatively activated, but it is crucial to establish a contact between them. Of course, science tends to place theoretical thinking before and to let it prevail over facts, yet that is not in itself hindrance as long as facts are revisited. A theory that aims at being completely independent of facts would be arbitrary, consequently, whatever representation of reality requires corroboration by facts. Furthermore, whilst comparing theories, one finds that all theories try both to objectify themselves and their interpretation of other theories, while trying to objectify their interpretation of experience and their interpretation of the empirical conclusions of other theories. In other words, a theory tries to convey a non-explicitly a priori representation of the world. When it ensues from critical and self-critical practice, the process whereby knowledge is objectified distinguishes itself from the merely practical and dogmatic process of making the world

objective. Besides, to put it in Popper's words, only "an isolated statement on the world ... would, indeed, be beyond discussion"; yet a theory becomes isolated not only, as held by Popper, if it does not "refer to its link with any other object" (Popper 1972, 340), but also if it does not match a wider conceptual framework, either internal or external to the given theories. However, by and large, a theory is always synthetic, whether it refers to empirical provisions, it confronts itself with practical applications and consequences, or it reorganizes a logical process of inductive and deductive nature.

It follows that a theory, generally, encounters facts. Nevertheless, a real and full revisiting of those facts is accomplished when theoretical thinking clashes with the problems linked to experience or to the experiment, or to another theory, namely when the reality opposes some form of resistance to the theoretical interpretation that has been given to it. Moreover, the man may radically change the experiment beyond the actually observed data by means of laboratory techniques or resorting to virtual devices. In that case, the scientific law is more precise because it has to confront itself with a wider range of instances, obtaining an advantageous proliferation of experiences in order to reach the favourable outcome, which Feyerabend looks for within the proliferation of theories. At the same time, one must avoid a science that is totally virtualised or dominated by mathematical processes and which makes its own check-up tests, rather than vary and increase the tests that it really observes. A similar occurrence would open the way to a form of ideologically dominated science.

The impossibility of establishing the sequence of events and theories has been mentioned, yet one must point out that it does not mean doing without the differences between "observational terms" and "theoretical terms", or between a "discovery context" and "justifying context", as Feyerabend maintains (Feyerabend 1973, 85-86). My statement whereby the outcome of research is a synthesis of these two elements does not imply that the outcome does not follow a dialectic relation between the two elements. An agreement stating the synthesis is, indeed, preceded by a reflection on facts and on ourselves, on our actions and on our results, through a detaching thought reflecting, first distinctly and then in correlation, on themselves and on facts.

Thinking in itself tends towards infinity and consequently tends to universalise the extent of its outcomes, yet this very process of extending results, which in some cases is arbitrary, compels it to confront itself with the many observable or supposable instances. Infinity, being a tendency, it involves specularly both the theorizing and the testing that it undergoes to it, hence, as Popper (Popper 1995) states, the utmost exercise of man's will concerns the decision over what should be the end-point of logical-experimental testing. It is with reference to this aspect that man prevails over facts and controls himself.

If a dialectic relation between thinking and facts is necessary, how can it really come into being, how does it come into being in temporal terms?

It is a shared view that a feature of science would be its ability to disentangle itself from the immediacy of a prompt answer.

For example, Popper underlines the difference between the scientist and "the practical action man", pointing out that the latter "must always choose between more or less defined options", an instance that never occurs with the theoretical man. Starting from this assumption he comes to a conclusion (a rather unacceptable one, in my opinion) that among the many practical possibilities linked to a theory "it is not worth worrying because we cannot do anything about it: they are beyond our reach" (Popper 1975, 42-43). Kuhn shares this position concerning the difference between theory and practice when he states that "the scientist does not have to choose problems because they require urgent solution" (Kuhn 1995, 198).

In fact, the distinction does not only concern science and praxis, but also, in broader terms, theoretical thinking, practical thinking and their relationship with praxis.

The positions so far described are true in part, because they inform us on the different relations that man's several activities establish with life and man's history, a relation that may be more or less immediate.

Furthermore, these positions suitably identify different temporal dimensions of thinking.

Nevertheless, what does a similar description of the relationship with the reality entail?

It is now clear that the relation between thought and the reality requires a twofold approach on man's part. On the one hand, the man places himself before the world with his bundle of ideas and logical forms, so that he interprets reality (on the basis of his already established approach) rather than describe it. On the other hand, the man encounters novelty and problems and with them he initially establishes identifying relations, through intuition, understanding, processual logic. The relationship with the reality is real and checkable precisely because it starts on that double basis, which allows man both to find his place in the world and to recognize the world as such, without losing himself in it. Thus, the detaching of theoretical thinking, which may be either preliminary or subsequent, is not a separation, yet it requires a relation that either follows a previous relationship with the reality or in any case involves revisiting the reality. A long temporal process that should not aim at a synthetic frame would be a purely mental and arbitrary exercise.

Knowledge and Consciousness

As Popper points out, the detaching of theoretical thinking is, thus, linked to the possibility of carrying out a "critical debate of rival theories" (Popper 1975, 110-111) in a more profound way than we do in practical life.

Laudan requires, hence, that this critical practice to extend on the scientist's part to include the "philosophy of science" whence theory comes from, since "it is unavoidable that every description on part of a scientific historian be coloured by the way he perceives how science operates". (Laudan 1979, 196).

However, that does not always occur.

That is precisely the point: both Popper's (Popper 1995) and Laudan's (Laudan 1979) requests somehow refer to the man having to take a decision. As mentioned, Popper (Popper 1995) underlines that the arrest of the controls (including exchanges between theories) depends upon man's choice. There is no doubt that science itself cannot do without cross-theory testing, consequently, it cannot avoid critical exercise, but its intensity relies on ourselves. Moreover, critical exercise concerning one's own theoretical framework and/or that of others does not necessarily entail a similar critical activity with regards to our cultural and metaphysical framework. In other words, theoretical critique distinguishes itself from the self-awareness of our psychological and philosophical substratum and that entails taking a further decision.

Henceforth, the detaching from the reality no doubt is a feature of theoretical thinking, but if it does wish to be productive and it does not want to degenerate into a process of total separation, either before or after it has to re-establish a relationship with the reality and with self-awareness. Knowledge entails transforming the very world it represents and conceptualises, as well as transforming itself and, thus, it assumes a critical and self-critical revision of the being we have known.

At this point let us tackle another problem raised by Popper (Popper 1975), namely that of how theories and ideas, in turn, affect our conscience.

An original conscience relating to the world does not (originally, we only have a genetic framework and the inclination to explore). In fact, the original conscience is generated in the close contact with the outer world. Nonetheless, it is also true that we constantly face the world with a unifying conscience and with a conscience that we constantly unifying. At the same time, our psychological products (which are also affected by our conscience) operate upon a unified conscience and, to varying degrees, affect it establishing a dialectic relation. By contrast, one may say that precisely such distinction between ideas or concepts and unified conscience bilaterally requires a mutual relation, almost between two objective

entities, the objective self and objectified thought. The twofold objectifying process turns into a subjective one exactly because it has to be unified through an achieving consciousness process, which, in turn, settles as an objective result that is now unified and turned into a synthesis.

In order for theoretical thinking to be such (namely to be something we acquire, and we can be aware of constantly and freely), as well as for theoretical thinking to play the role of a critical device, it must necessarily undergo the process whereby its activities are made objective and subjective. Yet, the free re-evocation aimed at critical practice is an opportunity we have and it entails our decision and our determination.

In a nutshell, one can say that our mental and psychological activity reaches an objectifying process, though it is not unaffected by whether it is or not coupled and corroborated by critical and self-critical practice, that is necessarily linked to our willingness and to our decision-making ability.

The Comparison between Theories and the Scientific Progress

Furthermore, as such approach makes our ideas and thoughts comparable and it makes linkable also our ideas with our thoughts, hence it opens the way to the solution of the problem of comparing different scientific research traditions.

Instead, some epistemologists deny that is possible.

Let's take Kuhn as an example, according to whom the impossibility of comparing different theories has several causes: the "arbitrary element consisting of historical and personal incidents" (Kuhn 1995, 23) underpinning knowledge; the impossibility of ascertaining "whether or to what extent a specific theory suits facts", so that between two theories one may only find which one "better suits facts" (Kuhn 1995, 179) (yet how?); the fact that choosing among different theories is based on a set of values and this entails lack of communication among "those who purport immeasurable theories" (Kuhn 1995, 238-239).

Also Feyerabend mentions "several deviations from the right and rather boring path of rationality" in real science. Moreover, regardless from that, given the limiting nature of the notion of "conceptual continuity", one has to renounce the comparison between differing theories as it is only possible to discover the "inner inconsistencies" of a theory (Feyerabend 1973, 112-113). Yet, would such inner consistency of a theory not refer to a dialectic?

On the contrary, Laudan maintains that "research traditions existing at a given time" may be organized "according to the progress they achieve", "although ... they are utterly immeasurable in terms of what they purport with reference to reality" (Laudan 1979, 174).

One may object to Kuhns's considerations (Kuhn 1995) stating that the unavoidable incidents within knowledge tend to be overcome as knowledge itself leads to a stabilizing process of both oneself and of one's knowledge. Likewise, though being assumed in an a priori and subconscious manner, values try to justify themselves and the consequently assumed behaviours, especially if one engages himself in comparing values. As a consequence, the correspondence to facts is no longer arbitrary because it is inferred from a dialectic relation between theories and between theories and facts. Such matching may be measured in terms of complexity, namely in terms of accountable facts or number of features of a single fact explained, and, above all, owing to the inner and outer consistency of such complex explanations.

With regards to Feyerabend's quotation (Feyerabend 1973), one should also mention that a complex theory, that is one capable of including in its framework parts of contrasting theories, acknowledging their partial validity and contributing to better explaining some of their intuitions, does not exclude or preclude prejudicially rival theories. At most, as Feyerabend (Feyerabend 1973) himself points out with reference to a comparison between

classical theory on physics and relativism, a complex theory must also exclude and reject only some theories or parts of them.

Moreover, when at one point there occurs a shift in the beliefs underpinning the different scientific theories, at some stage, we become aware of the shift, consequently also their stated immeasurability, be it wholly or partially, still derives from some type of measurement and of comparison between different theories. The same decision concerning their immeasurability and our statement on it ensue from their initial assessment, rather than from a prejudicial rejection of the rival theory. Only when we experience and unconsciously identify with a belief, a viewpoint, a theory, we never submit it to a preliminary analysis and a subsequent critique. By contrast, the conscious and critical immeasurability is already a form of comparison.

At the basis of the notion of the immeasurability of rival theories, there is, however, the assumption that every theoretical framework includes metaphysical element, which cannot be compared.

Then Lakatos (Lakatos 1996) is right when he states that more time is needed to decide which theory is the best one and the most progressive one; from my point of view, more time is needed to sieve the ideological elements mixed within a theory. With reference to the notion of immeasurability, as Lakatos holds, history is a better judge than Popper's method of falsifiability.

Indeed, history lets different ideologies flow over time, each one establishing a link both with its direct and previous rivals, be it even just the immediately preceding ones, so that every ideology strives to justify itself and disrepute the others, and, in order to do so, it compares itself to the others and estimates them.

In other words, there comes into being a unique historiography (not a single historiography), which, though acknowledging gaps between cultures, methods and contents, seeks to introduce some form of meta-language on the basis of which man's whole history may be unified, synthesizing within a unique framework the philosophical debate, whether it has been completed or it is underway. Moreover, the passing of time tests the assumptions underlining different ideologies, hence it naturally purifies theories of their ideological element.

Lastly, if we establish a comparison between theories in terms of their complexity, both with reference to the explanation of reality and to the degree of theoretical expansion, then we must admit that there occurs some progress and that this cannot avoid affecting the other metaphysical aspects that a theory inevitably includes. Just like our conscience affects the products of thinking, then theoretical progress reflects upon the historically acknowledged metaphysical theories. A further complex theory, indeed, involves a revision of ideologies and challenges them into being more complex, that is more apt at establishing a greater number of relations with facts and convictions.

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