Breaking the Reign of Definitions- The Case for "Science"

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Abstract

This study argues that dominative role of some attributions given to "science" constrain people from comprehending diverse approaches to nature of science in today and in the past. A way to embrace different views may be found by means of a more general definition, which includes more attributions. This study has presented how –only- two well-known characteristics attributed to science may make development in our view about the nature of science and what is science or not.

Proposal

The meanings attached to a word may experience changes throughout the history and the term "science" is not excused from this meaning shift (Gulnar, 2007). Therefore, what may be regarded as "science" –let's say- 200 years ago may be considered as non-science after 200 years. Since it is not right and perhaps unjust to judge the people of past with the laws of today, -at least- two alternatives appear to resolve the problem: Either to judge people of each time interval using their own laws, or to unite the laws. I prefer the later one since it involves the ones who haven't surrendered to "western science of today" too; therefore which is more universal.

This study, first, unites two distinct characteristics attributed to the term "science" under the same definition and then argues that this definition may embrace more diverse approaches, even may unifies apparently distinct epistemologies and give insight about the nature of the sciences in the past.

17th century dictionaries define science as "knowledge; skill" (Blount, 1659; Coles, 1684) and indicate that it is derived from the Latin word "scientia" equated to knowledge –covering fields such as philosophy, history, literature and theology. Knowledge and skill are distinct but related terms and some languages have different terms for "science as knowledge" and "science as skill". Production of knowledge may require skill; skill may require some knowledge –it cannot move in the vacuum –different from imaginary. However, this does not break the feature of being distinct and causes no causal relation for existence.

In today's –westernized- science, "science as skill or methodology" overrules "science as knowledge". The "mean" has been glorified since it leads someone to the "end"; the "end" has been despised since it can –according to some- only be reached by means of "means"! According to Einstein, "science is an instrument by means of which men are able to obtain … concepts of reality" (cited in van Gigch, 2002). According to him, empiricism is not the only way of understanding the natural phenomena (van Gigch, 2002). Even empirical data, according to Manchur, "never single out one, unique theory; different theories, incompatible with each other may agree with these data" (Nikiforov, 2007). There is no one way of interpreting the "absolute reality". Science is a knowledge accumulation endeavor to increase

interpretations of “reality” –of nature, events, human characteristics, communications, spirits, etc. By including skill part –and omitting many other parts- science may be defined as “production and attainment of knowledge in order to open way for different interpretations of “reality” -by utilizing different instruments”.*

Diverse Approaches under the Existence of Single Method

This definition may be useful in terms of its possibility to show that two different approaches for knowledge and skill part may be hold by the same person. In order for better demonstrate this, it may be better to keep one of them –instrument- constant. Let’s control perception of a realistic methodologist who favors empiricism: The only way to reach the truth is by means of experimental studies; logic and theology does not give objective way of interpreting the nature. And since natural sciences, especially physics, is the strongest in the area of experimentation, let me concentrate on it.

Different Interpretation of Nature and Experimentation

Experimentation is a quite strong tool to interpret the universe and it has been favored to other tools since it utilizes concrete data and testability of that data. Moreover, reductibility of that data into the simple relations as principles and laws helped rapid advancement of knowledge and technology which mesmerized society. While technology and other applications of science are of big-importance, I have not included this precious attribution into the definition of science for now, since it may be better to go step-by-step.

Pre-Galileon observers correctly witnessed that the heavier bodies fall before then the lighter ones. It was experiential, and its results were being used in technologies such as artillery. Later inventions of knowledge produced discovery of other manifestations of nature and this was more admirable: The nature does not make discrimination towards the bodies of different masses, under the absence of friction. Same methodology, same data and different perceptions of the world.

Newtonian mechanics is an instrument to discover the movement of bodies. Lagrangian and Hamiltonian mechanics is another tool that takes us to the same place but by following different admirable paths: principle of economy. Same data, mixed methodology (empiricism and idealism), same findings with different perception of admiration.

The explanation of the nature becomes more open to interpretations when the object is micro-universe. The theories produced for micro-universe get higher repute when it is in congruity with the experimental data obtained in the observable-universe**. Kinetic theory, using Newtonian mechanics and abstract models, is found to be in conformity with the experimental data about gases, the laws of what was already established. This conformity opens way to a very different approach to interpret the nature: statistical mechanics. While probability seems to contradict with very nature of experimentation -the exactness of data obtained and its testability (obtaining same data with same procedure)-, the domains of targets are different. Experimentation is in the observable-universe, probability is in the micro-universe. The interpretation is more to explain the nature of micro-universe than to explain the nature of observable-universe.

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*This definition does not necessarily cover all dimensions of “science” and addresses to all sciences.
**Observable with five senses –sometimes by means of tools like telescopes, microscopes.

Quantum mechanics also follows similar method. Probability wave function of matters introduces a new interpretation about the nature of matter but its strength comes from its accordance with the data in the observable-universe. Otherwise, the production of this knowledge is neither inductive nor completely deductive.

Accordingly, while an experimentalist in natural sciences relies heavily on his/her tool in order to reach the reality, s/he is open to diversity of interpretations and does not single out one interpretation as the only correct one. S/he may accept that different perceptions of the nature may exist for the same data and if it is the case for experimental data, the reliability of what is quite strong, s/he will be more tolerant towards sciences of other branches.

It is, however, should be noted that many data obtained by experimentalists are also related to and produced by perceptions of people. These include the smallest distance between events – line for Euclidian space-, time, force and mass. Therefore, different perceptions of the universe may be possible by means of defining other basic entities, if possible. I will mention more about this in the Logic and Reasoning part in the following section.

Different Methods Utilized and Diversity of Perceptions about Reality

The skills in order to reach to knowledge are not restricted to experimentation, though it has supreme place among methods. Indeed, science experiences shortage of methods to understand the nature of reality. Husserl, according to Wang (1995), spends much of his life to develop a science of subjective while it is suspicious that he was successful (p. 167). I will present logic and reasoning as another tool in order to reach conclusions about one's perception of his/her universe. And I would also like to introduce "intuition" as another source of knowledge which helps in diversity about perception and production of truth.

Logic and Reasoning

Symbols, as mostly used by mathematics, are being utilized in order to make inferences about reality –though its purpose may not always be to do that. Since the ocean of symbols becomes the ether for ideas and perceptions to travel, it is difficult -if not impossible- to think of a perception without establishing the operational definitions of that symbols first. While someone may construct his/her new abstract Matrix-like world on his/her previous defined sets of abstract symbols, s/he may also use it as a tool to uncover the so-called reality. According to Hawkings, "so-called imaginary time is real time and ...what we call real time is just a figment of our imaginations" (p. 137) (as cited in Midgley, 1995).

As I mentioned above, even basic entities most tangible to us, such as distance, time, force and mass are symbolization of our perceptions. It is kind of social construction of symbols by means of reconciliation. When it comes to psychology, it may be difficult to reach an agreement. The time, which elapses equal time-intervals for in so-called equal time spans, may be different for a person who is so happy or too unhappy or for a person in dream.

Logic and reasoning uses these symbols by means of other compromised axiomatic statements. While there could be drawn only one straight line that passes through two points, infinite number of straight lines may be drawn thorough two points on a sphere. Two parallel lines can never intersect in Euclidian Space but they may sometimes intersect at infinity. The abstract power of mind is incredible and without it many progresses in the experimental science would never be achieved. Introduction of derivatives and integral is among them. You can never divide zero to zero, but the concept of instantaneous velocity or acceleration is best

understood by means of it. The concept of force is also more beneficial by means of introducing it as derivative of momentum with respect to time. Introduction of Fourier Series make it possible to show that every motion, however it is complex, may be presented as collections of many oscillating movements.

Production of new knowledge upon previous ones may best be achieved by means of using logic and reasoning. The abstract concepts and relations in for example geometry may work like stereogram, when on what it is placed, the wonders of the nature are revealed.

Intuition

The driving force of intuition on the production of knowledge is not secret. Physicists have intuition that the theories explain the nature should be mathematically beautiful to be correct (p.387, Motz and Weaver, 1989). Definitely this was not a law of nature but this feeling forced them to focus more on symmetry. There were occasions that this intuition worked against development. For example, Kepler was reluctant to reject the idea that the planets moves in circular paths. Dirac's four equations were distasteful to Heisenberg and Pauli, who at the beginning were more inclined to reject it (p.299, Motz and Weaver, 1989).

The intuition that the universe is ruled by simple and beautiful laws is also under the domain of sciences of religions. However, there are debates about the role of intuition in sciences of religions and other sciences. The ambiguity in the definition of intuition -which is sometimes meant to be "perceivable and comprehensible"- may have roles in these debates. (I think western languages have shortages in the words related to spiritual and bodiless phenomena and more focus is to be given eastern cultures and languages.) Poincare also points to the importance of intuition in the production of knowledge and many meanings attached to "intuition":

> Pure logic could never lead us to anything but tautologies; it could create nothing new; not from it alone can any science issue. In one sense these philosophers are right; to make arithmetic, as to make geometry, or to make any science, something else than pure logic is necessary. To designate this something else we have no word other than *intuition*. But how many different ideas are hidden under this same word? (p.319, cited in Huber, 2006)

According to Majer (2006), there are many scientists that favor "Kant's epistemological assertion that we need besides pure thinking (logic) another *non-empirical* source of knowledge, called pure intuition, in order to understand how empirical knowledge is possible at all"(p.47). Kant, however, strictly opposes to the attempts to use mathematical methods in metaphysics just since both have relations with intuitions. His attempt to show metaphysics as non-mathematics, at a time when mathematics is quite strong, seems to me similar to Popper's re-description of the term "science", by including "possibility of falsibility" factor (McComas, 2002) and labeling metaphysics as non-science, at a time when science is quite strong. Sutton (1998) probably didn't mean re-description of "the term science" when he eloquently put that "science is not about describing, but about re-describing"(!) Popper's this attribution given to "science" (possibility of falsibility) in order to reach valid knowledge, however, will also make mathematics as non-science while many philosophers of mathematics argue that true knowledge is the knowledge in mathematics –since it is constructed in mind- rather than knowledge in natural sciences where there is only models, interpretations and reconciliations, and where we cannot reach certain knowledge (pp. 4-5, Carson, 2006).

Popper's "possibility of falsibility" argument and then labeling metaphysics as non-science is problematic since he argues something like the following statement: Knowledge in the non-

falsifiable universe is not “knowledge” since they cannot be falsifiable. Even if his statement would be correct, it would not be right that the new-comers hold the sovereignty of the definitions and to expel/emigrate aboriginals for the name of civilization!

My definition of “science” searches for the interpretations of “reality”, not only for “the nature”. It would not be generous for someone to limit himself/herself only to the nature and to close doors to the “possibility of existence of non-observable”. Intuitions may play a role of “spirit of mind” in the understanding non-observable spirit of nature. It may perhaps does not give a clear picture of reality, but the crude image of non-empirical reality may be supported by empirical evidences. For example, William Paley’s watchmaker analogy, which utilizes empirical evidence and logic, addresses more on intuitions than on mind. The general interest of public, then shows, how reconciliation in the intuition may exist. In the end, the knowledge in the natural sciences was also reconciliation.

Conclusion

This study tried to include two attributions given to science –knowledge and skill- into same definition. This is done in order to show that (1) philosophical approaches are not intrinsic to the nature of humans; a person may have different philosophies towards different attributions. This is also valid for knowledge and skills as well. The importance here is that both attributions are given to science, and therefore understanding the philosophical stand of someone by just concentrating on one attribution may not be correct. (2) the higher importance given to experimentation method diminished the importance of “knowledge” and “other methods” after 17th century. This article argued that knowledge is subjective perception/interpretation, whether it is reconciled in the society or not, and since perceptions are related to both cognitive and affective factors, reasoning and intuitions may be important sources for the formation of knowledge. Moreover, it seems that there are some attempts to re-define the term “science” or to change the attributions given to it. The reign of these definitions –whether it is done consciously or not- excludes many disciplines from “science”. It would probably not be a problem to re-classify the disciplines and put them into different categories; however, labeling some disciplines as non-science would mean to despise them at a time when natural sciences overrule. Therefore, rather then concentrating on the methods to produce knowledge, focusing on solely knowledge may be more encompassing. By means of this embracing definition, pre-17th century Knowers will be rescued from being thought as primitive-beings and social sciences will be given more repute.

Implications

This study shows how it is important to study the term “science” linguistically and implies that more study on this issue and social (re-)construction of the term “science” is necessary. Moreover, it may be worthy to study the terms close to “science” in other cultures and languages. Tentativeness in the definition of the term “science” may suggest why it is difficult to understand “nature of science” and “tentativeness of science” as well.

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