METACOGNITION AND THE ACQUISITION OF KNOWLEDGE PROCESSES UNDERLYING SCIENCE

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Resumen

Flavell (1976) definió el concepto de *metacognición* utilizando dos enfoques diferentes para dicho término: uno se relaciona con el conocimiento sobre el conocimiento personal de uno mismo y el otro se refiere al control que la persona tiene sobre su propia *cognición*. En epistemología, la reflexión sobre la validez del conocimiento de las teorías científicas genera criterios para reconocer la calidad científica del conocimiento y distinguirlo de otras formas de conocimiento (Klimovsky, 1990). La *metateoría* controla la actividad intelectual en los distintos campos disciplinarios. La metacognición y la metateoría conducen a la optimización de los procesos del pensamiento, como también al logro de un conocimiento epistemológicamente válido.

Palabras clave: Cognición - metacognición - teoría - metateoría.

Abstract

Flavell (1976) defines *metacognition* providing two different approaches to the term; one, related to the knowledge about personal knowledge, and the other one referring to the

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control of personal *cognition*. In epistemology, the reflection about the validity of scientific theories builds up some criteria to acknowledge the scientific condition of knowledge and to distinguish it from others (Klimovsky, 1990). *Metatheory* controls the intellectual activity in disciplinary fields. Metacognition and metatheory lead processes to optimize thought and to arrive to epistemologically valid knowledge.

Key words: Cognition - metacognition - theory - metatheory.

With reference to the term *knowledge* three interrelated approaches should be considered.

Knowledge is generally considered as a result, i.e., the statements that express characteristics or explain some status of things in the world. By this way, scientific knowledge provides reasons to justify the beliefs underlying such statements. This aspect of knowledge is identified as the first scope of the concept.

The justification reasons are involved into methodological purposes and related to the technical body that science develops to better represent hypothesis. So, this permits to distinguish *scientific knowledge* from other kinds of knowledge. In that concern, many distinguished epistemologists, specially Popper (1979) discussed when a theory should be considered scientific and the criteria to determine the theory's scientific character, and status.

Other considerations, belonging to the second scope of the concept, arise from epistemology and allow to identify the methodological aspects of science considered as an approach to knowledge and the strategies that permit it to construct statements.

Through history of science there are many searchers to quote, who devoted to this knowledge subject, taking into account both approaches, and confronted the subject not only at the enunciation level but also in relation to methodological aspects. Vygotsky (1995) asserted that failure relies on the analytical methods adopted by previous searchers. To face successfully the problem arising from the relationship between thought and language, one should know first which method of analysis can fully guarantee its solution.

Kaffka (1941) once asserted that behaviorist psychologists are right to deny the existence of conscience criteria, since this is the instance where the perception of personal experience methods fail. Notwithstanding, we reject his position. Since there is a perception of personal experiences; there are such a statements that could only be made by one person but cannot be controlled by anyother.

At this point arises the third scope of knowledge that consists of the mechanisms of control that allow to extent the basis of knowledge, with respect to a field of reality.

The provisional character is inherent to science. In order to improve the knowledge provisionally and previously stated, a constant criticism to knowledge should prevail. This allows us to state that knowledge embraces self-improvement as a dialogue of cognitions.

This way, we can state that there is an external aspect of the scientific knowledge, basically founded in considering it as result of previous assumptions, i.e. as some statements that explain or describe a status of things in the world.

According to this point of view, two approaches that are also knowledge have been left aside: an epistemological-methodological scope that allows to create a new knowledge, and, at the same time, to distinguish what should be considered as source of knowledge from the methodology used to justify it.

The third approach is based on the critical character of knowledge, which implies a constant reflection on the provisionally valid knowledge, in order to be confronted so that new problems arise and the circle of knowledge starts again. Both first and second approaches could have the function of controlling the scientific activity; they are simply considered approaches from the metacognitive scope of concepts.

In connection, Flavell (1970-1976) makes an analysis of the term *metacognition*, and affirms (on the basis of different types of works related to memory he issued) that *metacognitive activities* refer to the kind of knowledge related to personal cognitive processes, and products or well everything related to the properties of data or relevant information related to the acquisition of knowledge, its active checking and the subsequent control, and organization of these processes in connection to the objects or data generally involved in achieving an actual goal or aim.

This definition provides two meanings: One refers to knowledge about personal knowledge and the other refers to the processes of checking, verification and control, i.e., to the execution processes embraced in the theories of information processing.

A third approach to the concept can be identified and refers to personal experiences or metacognitive experiences which include the prediction of the consequence of an action or event, the checking of results arising from personal actions (I did it?), the verification of personal activity (How am I doing it?), the confirmation of reality (Is it worthy to do it?) and many other deliberate behaviours of coordination and control to learn to check and solve problems.

In other words, these three approaches or scopes characterize an efficient thought, providing a developmental pattern applied to different activities. It is characterized by a close and dynamic relationship among knowledge about knowledge, knowledge about the strategies of knowledge and, at last, knowledge about personal processes of metacognitive control.

Conclusions

According to the above exposition we arrive to the following conclusions:

The various approaches to knowledge above referred to methodological aspects and critical functions of science involve metacognitive characters by themselves.

This general approach embraces important consequences in the transmission of scientific knowledge.

It avoids loss of value of the term and contributes to gain value for the two stated scopes.

It allows to the comprehension of complex phenomena since the consideration of an inter-disciplinary view that (being respectful to different traditions) contributes with partial results to improve the comprehension that cannot be fully achieved, but from the first stated approach. Therefore, although the statements used above arose from natural sciences, and are transferred to the study of human beings, it helps to avoid a non-critical eclecticism in studies related to human phenomena (Narvaja, 1999).

Regarding the concept of science progress, the three approaches allow to understand the progress of science as the improvement of partial paradigms by using the dynamism of knowledge dialogue in terms of gathering improvements that incorporate traditions to a higher approach, i.e. by means of a new synthesis.

The pattern suggested stands out of internal validity, so that, the transference of this requirement to higher contexts guarantee the use of statements at a higher level with the validity of the previous level.

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