

Ontology and the Learning of Science

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Abstract. Ontology is nowadays acquiring much importance for understanding key factors favoring or hindering the learning of Science. Since years ago, we find authors mentioning such aspect, most of them treating it in isolation, related mainly to conceptual change; lastly, we find authors merging the role of epistemology and ontology as outstanding features to consider in learning. But it is difficult to find how ontology by itself is imbedded in the learner's multifaceted way of acquiring knowledge. The objective of this paper is to show the role of ontology in this process, together with other key factors influencing learning, by means of the ONEPSY model

1 Ontology in Science Education. A quick (incomplete) review

In the last decade, it is necessary here to highlight the work of M. T. H. Chi, that is well known almost for everybody in this field. From a framework taken from Cognitive Science, she presents her widespread "*ontological tree*" in 1992 [1]. Her main thesis is that conceptual change is so difficult to occur due to the necessity for the subjects to shift from a branch of the ontological tree to another branch. In subsequent papers Chi refines the ontological tree [2]. Other well-known author is Treagust -and colleagues- [3, 4]. He works in conceptual change within a mental model framework. But in fact, he only considers the ontological component of mental models.

We can say that the importance of ontology is increasing in this decade. It happens not only in Science Education, but in Science itself. In the monograph of the journal *Social Studies of Science*, devoted to the theme: "*A Turn to Ontology in Science and Technology Studies?*", we read: "*Until recently, the term 'ontology' had been sparingly used in the field. Now it appears to have acquired a new theoretical significance and lies at the center of many programs of empirical investigation*" [5]

That way, in Science Education literature, authors find that the misunderstanding of some scientific concepts may arise from an error in people's ontological assumptions [6]; pointing out ontological and epistemological commitment as conditioning science learning [7, 8]; and there are authors attempting to operationalise ontology and epistemology, as a means for introducing concept knowledge in classrooms [9]

2 Our proposal: The ONEPSY Model

1. We think that today it is difficult to think about learning concepts in an isolated manner. So, we treat the different components mentioned above within a system: **a model**.

2. It is well known that a key factor, which is always present in any kind of knowledge, is **Psychology**. But Psychology is hardly mentioned (if any) in the related literature of this field.

3. In the literature we have reviewed, authors do not give an account of the **mechanism/s** that drives the subjects' change in their concepts or models.

The ONEPSY (ONtology, EPistemology, SPYchology) Model tries to harmonize the several factors shown in the above review, and these others stated here. Its theoretical ground has been taken (among other sources) from Cognitive Psychology [10], Artificial Intelligence [11], Philosophy -Ontological studies- [12], and Psychology [13] attuning these with data gathered from Science Education research. Figure 1 shows a graphical representation of the ONEPSY Model

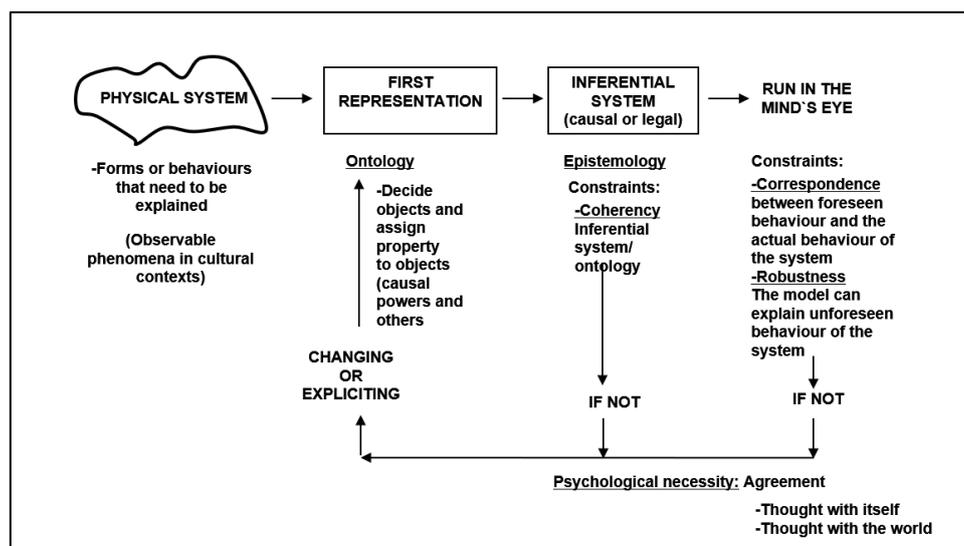


Figure 1. The ONEPSY model. After R. Gutierrez 2001 [14]

3 Conclusion

The ONEPSY Model shows the relationships **Epistemology/Ontology/Psychology** in learning; and also displays the **mechanisms** that drives the constructions and reconstruction of knowledge. Different research papers have proved its utility for that in a variety of tasks in Science Education. But this will be the object of another paper.

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