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**Duval, Raymond**

**Transformations of semiotic representations and the practice of mathematical thinking. (Trasformazioni di rappresentazioni semiotiche e prassi di pensiero in matematica.)**

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Summary: Recurring difficulties in learning that are caused by mathematics compel us to examine not only the contents and the teaching procedures, but also cognitive processes liable to mathematical practices. The aim of this study is to introduce a cognitive analysis of mathematical activity. The particular epistemological situation of mathematics, with reference to other fields of knowledge, leads us to ascribe a fundamental role to semiotic representations. First, they are the only way by means we can approach mathematical objects, and this fact arises the cognitive problem of the passage from a representation of an object to another one, referred to the same object. Then, and above all, mathematical practices closely imply the transformation of semiotic representations. On the basis of some examples of different numerical, visual and symbolic representations, we show that mathematical activity fuses two kinds of semiotic representations transformations: one corresponding to a change of the representation register, the other consisting in the use of transformation possibilities typical for every register. The first kind is pointed out to be the most difficult and misleading for the students. Difficulties in the passage from a representation in a certain register to a representation in another register reveal the complexity, very often overlooked, of the articulation between representation registers used in mathematics. We finally show that the opposition between semiotic representations and mental representations is based upon a confusion between the system employed in order to produce a representation and the phenomenological modality of this production. Frequently mental representations are interiorized semiotic representations.

*Classification:* E20 D20 C30

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