AN ASPECT OF A DIDACTICAL PATH FOR APPROACHING THE CONCEPT OF FUNCTION: THE QUALITATIVE INTERPRETATION OF A GRAPH

Rosa IADEROSA
Middle School "Leonardo da Vinci"
Cesano Boscone - Milano – Italy

Nicolina A. MALARA
University of Modena & Reggio E.
Modena – Italy

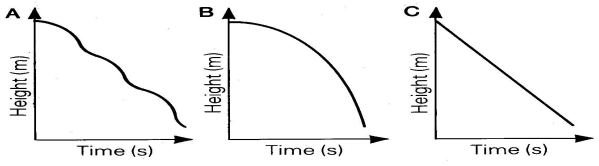
There are many teaching/learning problems surrounding the concept of function. These are bound up in the complexity of its history which are reflected in the partial or distorted views of the concept held by students as well as in the difficulties they meet as shown in various studies on the matter (we cannot give here any reference). We believe that in order to develop a true knowledge of a subject, it is necessary for the student to distinguish between mathematical concepts and their representations. Our hypothesis is that only through the co-ordination of different representative registers (verbal, tabular, algebraic, graphic) of a function the pupils can move flexibly and consistently between variational/qualitative and pointwise approaches to the funtion, even if the graphic level clearly plays a fundamental role.

What we shall present is a fragment of a wide research developed in this frame. We shall concentrate on the results of some experiments, carried out mainly in 7th and 8th grade, which concern the recognition and the qualitative interpretation of graphs relating to physical phenomena not associated to formalised rules, for what they express compared to the variability of the magnitudes in question. In particular, we shall look at the main concepts and difficulties encountered by pupils by analysing their work on the co-ordination of the graphic representation of a given phenomenon and the character of the same phenomenon when expressed verbally or which derives from the relative interpretation. An example of these activities is below.

The following table refers to a parachutist's free falling jump from an aeroplane:

time (s)	*0*	*5*	*10*	*15*	*20*
height (m)	*3000*	*2875*	*2500*	*1875*	*1000*

a) how high is the plane the moment you start the drop?
b) how many meters lower was the parachuter after the first 5 seconds?
c) one of these drops describes the drop. Which? Why?



The results about the pupils' real understanding of the meaning of a given graph, from the observation of its tendency, confirm the foreseen difficulties of reading if not preceded by activities of effective construction. In particular, pupils confuse increasing and decreasing development patterns, especially in the case of non-straight lined graphs. As far as we have been able to observe in the course of their studies, these difficulties persist substantially into the third year of middle school, even when the pupils have been introduced to further graph-drawing activities starting from functions given to them in the form of algebraic formulation.