This chapter is very useful because it provides the means to find, in the research literature, many results concerning common students' and trainee teachers' ideas concerning mechanics. Numerous now classical tests as well as the main predictable errors can therefore be collected by the reader.

Moreover, a viewpoint which is compatible with research findings is stated and proposed as a basis for teaching strategies: the learner should be in a position of being as active as possible in the building of his or her own knowledge. There is now a large consensus among researchers on that point, as is widely shown in this book.

On that basis, the author recommends emphasizing in teaching and teachers' training, the following aspects: qualitative analysis, explicit addressing of common ideas, debating, and this à propos of open situations of problems in various teaching contexts.

With these elements of information and of reflection, the reader has a decision to make. Will she/he make the predictable difficulties and errors explicit one by one, test by test, one situation being considered at a time? On the contrary, will the learner be informed of the "logic" which seems to underlie a set of common ideas. In the latter case, which scale should we adopt in the grouping of ideas, which ones should we account for together. Available elements to guide this choice seem contradictory.

On the one hand, a dependency of common errors with respect to the type of situation is observed. For instance, some questions very frequently raise a classical error, i.e. to assume a linear relationship between force and velocity, whereas other questions which are at first sight in the same domain very rarely give rise to the same error (Viennot 1979).

On the other hand, striking similarities exist between answers concerning physical situations which are usually dealt with in different chapters. For example, propagation of sound and motion of a projectile are commonly analyzed in a similar way: a dynamical "supply" due to the source seems to act as a permanent cause all along the progression (of the projectile or of the sound), to get lower in case of an opposing agent, and to determine at every time the velocity of the projectile or that of the sound (Maurines 1992).

Scattered knowledge on the one hand, unifying links on the other hand: in fact, common ideas do not "coagulate" according to the domains defined by traditional chapters. They can be accounted for to a large extent assuming ways of reasoning in which causality and time are central elements (Driver et al. 1985, Andersson 1986, Rozier and Viennot, 1991, Gutierrez et Ogborn 1992, Viennot 1993).

The main features of these reasonings are the following: linear character of causal analysis (one cause for one effect), ascribing of a cause (which is an undifferentiated amalgam of our physical concepts) to the object in evolution (and/or the "storage" of an initial cause in this object), temporal shift between cause and effect (Viennot 1996).

On this basis, one can understand why it is so often (wrongly) believed that the force exerted by a wrestler on his adversary is larger than its reciprocal at the time of his victory (Viennot and Rozier 1994), or why the pressure inside a gas is not taken into account by children unless this gas is provoking a motion (Séré 1985).

Considering these aspects of reasoning leads one to see "common ideas" and "problem solving" as intricate domains (Fauconnet 1984), and to interpret the existence of the "facets", using Minstrell's format (see chapter), in a less scattered way.

Anyhow, the way we make common ideas explicit is to be adapted to the particular students and teaching contexts. According to the cases, it may be useful to limit oneself to the surface features of common reasoning, situation by situation, or, on the contrary, to try and show its deeper roots.

References


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SectionC, *Comments on C1 from: Connecting Research in Physics Education with Teacher Education*


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