# Added Value in Education

When proposing activities for class practice or teacher education, Added Value in Education (AVE) is a key aspect. This should not be interpreted only as explanations aimed at deepening or re-shaping the specific content of knowledge addressed. Instead, we see AVE as an integration of disciplinary notes, research-based results on learning-teaching processes and tools to facilitate communication and use of technology. Here AVE is proposed as a synergic combination of suggestions to be adapted according to specific contexts. The goals are:

1. ***the fostering of appropriation and implementation of the experiments proposed***
   - in order to encourage integration of experiments into teaching processes;
   - in order to perform easy-to-assemble experiments using easily available, no-cost, low- cost or recycled materials;
   - in order to motivate students and teachers to search for materials to be used in the experiment.
2. ***appreciation of diverse viewpoints***
   - in order to organise appropriately various phases of learning cycles, such as: asking for ideas about phenomena or justified predictions about observations, experiments or models' results; performing the activities; using applications in different contexts; comparing results from all the phases; communicating and formalising. This allows the identification and analysis of various viewpoints in order to find commonalities and differences useful for linkage with other topics or disciplines
   - in order to foster familiarisation with varying approaches (what happens if … is changed?) and to identify relevant variables and parameters;
   - in order to address teaching rituals that may result in misleading argumentation.
3. ***discussion with those learning***
   - in order to elicit naïve ideas and reasoning patterns;
   - in order to trigger interactive cognitive dynamics through peer learning and the sharing of viewpoints;
   - in order to address ideas and deeply rooted points formed by the learner's experience.
4. ***discussion of possible reactions to common answers and comments***
   - examples of learning difficulties studied and plausible underlying reasons (i.e. through linking experimental data and models, overlooking important aspects, etc.)

## *Suggestions and help can come from resources concerning:*

- students' ideas and reasoning patterns in regard to conceptual nodes of physics conflicting with disciplinary knowledge. Physics Education Research (PER) has studied many examples that can be used as a starting point in building long-lasting knowledge of physics (see Duit, R. (2010) Bibliography – STCSE (Students' and Teachers' Conceptions and Science Education)
http://www.ipn.uni-kiel.de/aktuell/stcse/download_stcse.html
For each simple experiment, some emblematic reasoning patterns are described briefly.

- significant experiences and viewpoints in PER. In 1998 and 2008, the ICPE (International Commission on Physics Education) published "Connecting Research in Physics Education with Teacher Education, Volumes1 and 2. Free download at
http://web.phys.ksu.edu/icpe/Publications/index.html UPDATE REF
Volume 2 addresses such areas as: About Physics, About Learning, About Teaching, Technologies for Learning and Teaching. The contributions regarding conceptual understanding and facets of didactical lab-work are particularly related to MUSE rationale.