Teaching Physics in Primary School - Problematization as a basis for experimental activities.

Roberto CRUZ-HASTENREITER

IFRJ, Campus Rio de Janeiro, Rua Senador Furtado 121, Rio de Janeiro, Brazil

Brenner RAILBOLT

UNIRIO, Departamento de Física, Avenida Pasteur 458, Rio de Janeiro, Brazil

Flavio RODRIGUES

IFRJ, Campus Rio de Janeiro, Rua Senador Furtado 121, Rio de Janeiro, Brazil

Abstract. This work presents preliminary results of an investigation about the use of experimental activities, from problematization, in physics classes to primary school students. It is proposed initially a reflection about how experimental activities based on solving problems can contribute to the teaching of sciences from a broader perspective. We present some results of a didactic action, from an empirical study. The construction of data from discursive interactions was used as a methodological reference, and content analysis was used as a data analysis tool. Some data were obtained from the textual and pictorial representation made by the students.

1 Theoretical and Methodological Framework

Experimental activities related to the contents of physics have been developed based on the approach Inquiry Science Teaching (IST), and from a perspective of problematization. The IST appeared in the middle of the 20th century as a strategy to implement in the classroom. In this pedagogical approach, the scientific concepts presented concern only one of the dimensions worked. From this perspective, the learning objectives are broader, including the perception of making science a human activity and the understanding of the need to devise "ways" of doing it. The epistemological, social and conceptual dimensions are incorporated here. According to IST, you must learn to observe, plan, formulate a hypothesis, think, argue, and to create explanatory models. Basically, it is necessary that students be genuinely committed to the proposed activities (Capecchi and Carvalho, 2000).

The perspective of problematization is included in the reflections of this work, considering that it is present both in the activity of production of scientific knowledge (activity of the scientist) and in certain activities of science classes (Fabre, 1999). We highlight that problematization in this context implies a methodological systematization of the problem-solving. In this aspect, problematization includes that Orange (2006) pointed out as: empirical record; registration of models; explanatory records.

The present work is qualitative investigation. The data were constructed from the discursive interactions obtained from the audio and video recordings of the experimental activities, as well as from the textual and pictorial representation made by the students after the didactic action. As a methodological reference for the analysis of the data, the content analysis, according to Bardin's (1977) perspective, was used. The theoretical methodological framework constructed from IST and problematization contributed to the creation of the unit of analysis and the initial categories, which contemplate its dimensions: conceptual; epistemological and social.

2 Some Data

Some data was constructed from audio transcripts. These were categorized into four initial categories: conceptual discussion; epistemological perception; social aspects of the activity; relationship with everyday life, shown in Table 01.

Categories	**(I) Experiment guides explanations.**	**(II) Explanations based on personal perceptions, without direct mention of what was observed.**	**(III) Explanations based on the group's perceptions, without direct mention of what was observed.**	**(IV) Explanations based on the teacher's orientation, without direct mention of what was observed.**	**(V) Explanations based on observation reinforced by the teacher's orientation.**
Epistemological perception					
Categories	**(I) No mention of the concepts involved in the activity.**	**(II) Mention concepts that are not directly involved in the activity.**	**(III) Mention to concepts that are directly involved in the activity, however incorrectly.**	**(IV) Mention concepts that are directly involved in the activity in the right way.**	
Conceptual discussion					
Categories	**(I) Preponderance in individual actions.**	**(II) Search for collective solutions, internal to the group.**	**(III) Search for collective solutions, external to the group.**	**(IV) Assistance from a more capable partner.**	
Social aspect					
Categories	**(I) Relate activity to daily life using a direct example correctly.**	**(II) Relate activity to daily life using incorrect example.**	**(III) It relates the activity to the daily life indicating the perception of generalization of the concepts involved.**	**(IV) It does not relate to daily life.**	
Relationship between activity and daily life.					

Table 01. Emergent categories from the theoretical framework.

3 Conclusion

The present work seeks to incorporate experimental activities in science classes aimed at students of Elementary School. We seek from this initiative the scientific literacy of students in a broader conception. Attempts are made to incorporate activities into science courses that place students as agents of building their knowledge. Working together, the space for argumentation, the opportunity to share with colleagues from other groups, and the way in which they led to the resolution of a problem, brings aspects present in the activities of building scientific knowledge often inhibited in traditional approaches.

References

[1] L. Bardin, *Análise de conteúdo*, Edições 70, Lisboa, 1977.

[2] M. C. V. M. Capecchi, and A. M. P. Carvalho, *Argumentação em uma aula de conhecimento físico com crianças na faixa de oito a dez anos*. *Investigações em Ensino de Ciências*, 5(2000), 171-189.

[3] M. Fabre, *Situations-problèmes et savoirs scolaires.* Presses universitaires de France, Paris, 1999.

[4] C. Orange, *Problématisation, savoirs et apprentissages em sciences. In: M. Fabre, & E. Vellas (Orgs.), Situations de formation et problématisation.* De Boeck, Bruxellas, 2006.