REFLECTIONS ON A PROBLEM POSING APPROACH

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ABSTRACT

This paper describes some general aspects of the problem posing approach, as developed at the CSMEU. It describes why this approach has been developed; what didactical problem it tries to focus on; from what perspective this is done; to what didactical structures such an approach may lead, and what its application may involve for a teacher. The arguments are endorsed by examples taken from recent PhD work, but placed within a wider perspective.

1. INTRODUCTION

In the recent past, much work has been done on the cognitive aspects of science learning, e.g., by developing and studying exemplary teaching sequences (Méheut & Psillos, 2004). However, Leach and Scott (2002) argue that in the latter work not enough attention has been given to the role of the teacher. Others focus on the role of motivation for science learning, while Osborne (this volume) emphasizes the importance of adequate scientific argumentation. This paper deals with a line of work at the CSMEU in which all these aspects more or less come together, i.e., the development of what we call a problem posing approach to science education. It addresses some small steps forward in our didactical insight, as this is the most that can be expected from science education research.

The origin of this approach lies in our work on curriculum development, i.e. the former PLON-project (Lijnse *et al*., 1990). This project had a major influence on contextualising Dutch physics education, though its cognitive learning effects were not as positive as expected. In retrospect, we may say that we overestimated the positive influence of contexts on conceptual learning, particularly as far as the experienced functionality of the concepts to be learned is concerned. A main problem was that, though we did our utmost to make the contexts used relevant for our students, due to our mostly *top down* didactics, from their point of view students often got the idea that they had now to describe more or less familiar life-world contexts in a – for them – strange way of physics. Since then, we have been looking for ways to improve the quality of our didactical approach. We have done this by means of developmental research (Lijnse, 1995, 2003) which nowadays has probably become better known as design research (Cobb *et al*., 2003), i.e.,

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developing, testing, and reflecting on actual teaching/learning processes in order to come to new didactical insights and theory. In fact, this connects in some way to much other research that has been done on developing research-inspired improved ways of teaching

2. WHAT IS THE PROBLEM?

In the final decades of the last century, extensive reports were published on all kinds of conceptual problems that students appeared to have with the learning of science. In relation to these conceptual difficulties, other problems were also reported that have more to do with the way students perceive the detailed teaching/learning process. It appeared that during the process of teaching and learning, very often students do not see *the point* of what they are actually doing. This was not only the case in our context-related teaching, but it also applies, e.g., to the relation between theory and experiment as reported by Joling *et al*. (1988) who concluded, in an evaluation report about an innovative teaching method in a chemistry classroom, that students "*carry out assignments without knowing what function they have. The relation between observations and conclusions becomes blurred due to a lack of purposiveness in the experiment"*. However, the problem is much more general. To give another example, Gunstone (1992) reported as follows:

> *"In the following typical example, the student (P) has been asked by the interviewer (O) about the purpose of the activity they have just completed.*
> *P: He talked about it…......That's about all.....*
> *O: What have you decided it [the activity] is all about?*
> *P: I dunno, I never really thought about it .... just doing it – doing what it says its 8.5 .... just got to do different numbers and the next one we have to do is this [points in text to 8.6]."*

In addition, Gunstone (1992) writes: *"This problem of students not knowing the purpose(s) of what they are doing, even when they have been told, is perfectly familiar to any of us who have spent time teaching. The real issue is why the problem is so common and why it is very hard to avoid."*

Now, in our approach we do not focus on explaining this problem, but on trying to find ways to avoid it. The commonality that Gunstone mentions, reflects an often occurring mismatch between the ways teachers and students perceive the teaching/learning process. In the teaching situation referred to by Gunstone, the teacher probably had a coherent conceptual pathway in mind, and thus also perceived his/her teaching activities as coherently aiming at a certain purpose, but from the point of view of the students this coherence broke down to separate learning activities that had to be worked through according to their number. Some of them may have been understandable, but others too difficult, thus blocking an experience of coherence and purpose. In our experience, this is not really amazing as, in spite of their perception, teachers often teach separate activities according to their number, i.e., they teach subsequent activities without relating them to one another. In such cases it is clear that students may wonder what they are supposed to