CHAPTER 8

FROM THEMES TO THEORETICAL LANDSCAPE

1. INTRODUCTION

I started out sketching a theoretical landscape that contributed to an imagined hypothetical situation and which gave ideas for arranging a mathematics classroom. From this arranged situation, a possible crucial description of practice was produced. Five dual-concept themes emerged through an analysis and each was developed with data from the case description. Much of this was done without direct reference to the theoretical landscape elaborated earlier. In this chapter I talk back to theory, that is working the themes into some theoretical landscape. In seeking connections to the earlier landscape, I could retain the original, erase parts of it, put in new colour, forms, and paint over some parts; or I could take a new canvass and make a different sketch of the landscape. In this new picture, I could remain in the same school of landscapes and still preserve some aspects, perspectives, some shapes, colours and form but bring some new ideas of my own having lived on the terrain that this landscape attempts to capture.

It is the latter approach that I am partial to as I produce this second theoretical landscape. I use the themes as a point of departure but elements from the earlier landscape will flow into and across these themes. Although I label the themes separately for ease of reading, I will not confine myself to a completely separate discussion of each, but rather attempt to interconnect them. The connection to concepts and ideas from the earlier landscape will also be discussed in a similar way. Much of the focus so far has been on the concepts themselves within the dual-concept themes. This will continue in this theoretical landscape, but in addition, I will also focus on the relation between the concepts in each of the themes.

I begin this chapter by first discussing the notion of “complementarity” which may be considered a foundational idea for this theoretical part of the analysis in the relation between the two concepts in each theme. In the previous chapter, this is the idea I alluded to, without explanation, as a relation of “opposite and complementary” between the dual concepts in the themes. This idea which provided a key for unlocking the analysis in a way that preserved the complexity of mathematics teaching and learning in this critical approach was first inspired through a paper by Brousseau and Otte (1991), aptly titled “The fragility of knowledge” which

“attempts to demonstrate a different aspect of the fact that the human being, on the contrary, is at the same time both the subject and the task of cognition or the source and the object of activity.
This two fold necessity leads to the apperition of a whole series of pairs of concepts: insight and action, intuition and formalism, and so forth, the character of which we have tried to show as both paradoxical and necessary, opposite and complementary. These oppositions are the source of the fragility of the act of knowing and the difficulties in the transmission of knowledge.” (p. 35)

The dual concepts of democracy and authority; freedom and structure; equity and differentiation; context and mathematics; potentiality and actuality form an opposition and an alliance, working antagonistically and yet also in co-operation with each other. They can be understood as being separate from each other but are also contained in each other in order to offer a deeper understanding of their meaning. The idea of complementarity holds the essence of their meaning and the relationship.

Brousseau and Otte (1991) illustrate implicitly the notion of complementarity - the complexity in the contradictory and complementary nature of their elaboration of mathematics teaching and learning. They have in mind quite a different mathematics classroom from the one I am concerned with when they explain the “paradox of the didactical contract” (discussed later). However, the importance of this idea of complementarity is emphasised in this arranged situation because the complexity is increased several times when the goals of mathematics teaching and learning are changed or widened as they have been when a social, cultural, political approach that integrates a critical perspective is brought into the classroom. Complementarity offers a way of analysing and theorising about what happens in the classroom that grasps a more sophisticated and deeper understanding of the dual concepts in the themes, and of the concepts themselves.

2. COMPLEMENTARITY

Complementarity has its origins in the work of the physicist and philosopher Niels Bohr. It might be useful to look at where and how this idea emerged, which is from an empirical reality, since it is metaphorically similar to the way in which I shall explore the idea. I too am concerned with explaining empirical data - classrooms and people rather than atoms and particles. The notion of complementarity, offered a way out of a dilemma that arose in quantum physics. The problem was, as can be found outlined in any basic physics textbook, that no single concrete mental image, combining the features of both wave and particle at once, is possible in the quantum world. A solution through the principle of complementarity, may be explained as follows:

“The wave and particle aspect of a quantum entity are both necessary for a complete description. However, the two aspects cannot be revealed simultaneously in a single experiment. The aspect that is revealed is determined by the nature of the experiment being done.” (Halliday; Resnick and Krane 1992, p. 1063)

Complementarity offers a powerful means for dealing with the problem of understanding the development and existence of significantly different theories explaining the same phenomenon. This can be demonstrated with reference to the phenomenon of light through two separate explanations. In one, light is understood