Chapter 5
Using Multimodal Narratives to Study Relationships Between Concepts

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ABSTRACT

In conceptual teaching and learning, relationships between concepts play a key role. This chapter describes a case where two conceptual fields, water and energy, were treated in order to promote understanding of relationships between them. It deals with the importance of “potential relationships” and describes how multimodal narratives contributed to those elucidations and to these practices in the classroom and their interpretation, as well as to the professional development of teachers. The chapter elucidates concept use, relating concepts, ways of discerning relationships between concepts, loss of relationship opportunities that were created by students, and ways of verifying that certain relationships were achieved.

INTRODUCTION

This chapter deals with part of a classroom study about two specific conceptual fields, water and energy. It focuses on the problematic of the relationship between them, and not on details about the two conceptual fields. The chapter assumes two main objectives: to promote multimodal narratives as an instrument to study relationships between concepts, and to help teachers to clarify topics and relationships to be treated.

The following problem was identified: the need for studies and educational interventions in the classroom environment to promote understanding of relationships between water and energy in teaching. The relationships between water and energy (RWE) are multiple, as evidenced by the Proclamation of the United Nations Decade of Education for Sustainable Development (2002) and the Johannesburg Declaration on Sustainable Development (2002). Mechanical energy is used to produce electricity. The energy of the sun commands the hydrological cycle. Energy is used to produce potable water. From water, hydrogen can be extracted to be used as fuel. Food energy comes from life created with water and energy from the sun, received or stored on the planet. In education, water and energy are studied.

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But relationships are scarce in teaching and research (Barbot, Lopes, & Soares, 2010, 2011; Cerqueira & Barbot, 2010). Water is the origin of life on Earth; it is the dominant element in the constitution of living beings, and it modulates the energy fluxes of the planet, namely, energy transfers (Allan, 2011). Energy is the base factor in the functioning and evolution of the world, of the planet, and of all human beings. The principle of energy conservation is crucial.

In education, when water and energy are studied, they typically are studied separately. Students learn that they are important for the sustainability of the planet and in particular for life, in which the human species is included.

THEORETICAL FRAMEWORK

The study referred to in this chapter (Barbot, 2014) assumes a constructivist view, which has solid and documented theoretical and practical bases, and currently constitutes the core of science education research. The study assumes that learning is always present and always interested, but this study does not focus on the qualities and or quantities of learning and its evaluation. It focuses on physical situations, tasks, models, resources, and physical and virtual models, and it makes suggestions tested in class as to its usability, feasibility, the students’ motivation, time required and resources required. All this is intended to explore in class what is the central object of the study: the relations between water and energy, and to build on contributions to teachers, offering possibilities and elucidating the potentialities to treat such relationships. In terms of the teaching-learning dyad, the study focuses on teaching.

Novak and Gowin (1984), referring to Ausubel, report that, in meaningful learning, individuals relate new knowledge with relevant concepts and propositions that they already know. Bruner (1997) points to the importance of the culturally shaped notions by which people organize their conceptions of themselves, of others and of the world in which they live. Buty, Badreddine and Régnier (2012) point to the importance of how knowledge relates one thing to other. Therefore, a concept is much more than a word, using a concept is much more than just saying it, and learning meaningfully implies relating.

The study was carried out by a teacher-researcher, as described by Griffiths (1985), who studied his own practice in a natural classroom environment in an example of action research. It also had case study characteristics (Bogdan & Biklen, 1994; Stenhouse, 1988). The study had the following specifications: it involved, in a school year, classes of Initial Teacher Training courses in a school of education; it dealt with the relationship of two specific conceptual fields (water and energy), focusing on the teaching aspect as a specific instance of the teaching practice.

To relate is to understand better. Establishing links, identifying causes and effects, and building rich conceptual networks means knowing significantly more and being better prepared for the profession and for active citizenship (Barbot, 2017a). But a concept is not just a word. A concept, according to several authors, among them Toulmin (1977), has two aspects: representation and use. It is constituted by symbolic representations – natural language – and by other symbolisms, such as equations and other mathematical formalisms, graphical representations, taxonomy and computer programs. Simultaneously, it is also constituted by specifications of its modes of use, application procedures, and scopes and validity contexts.

The main problem was the need for studies and educational interventions in the classroom environment to promote the understanding of relationships between two concepts (here, water and energy) in teaching. In educational research, a problem is a need that exists in some context and that does not allow