Chapter 14

Researching Science and Technology Teachers’ Decisions Through Multimodal Narratives

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ABSTRACT

This chapter aims to identify certain interaction dynamics between pedagogical decisions and students’ epistemic practices (EPs) that occur during science and technology lessons conducted by teachers at two different teaching levels. A content analysis was undertaken of multimodal narratives (MNs) of lessons based on two case studies of secondary and higher education teachers. MN excerpts are used to illustrate the interaction dynamics between pedagogical decisions and students’ EPs for each teacher. Results show that the secondary education teacher makes more pedagogical decisions than the higher education teacher and that the secondary school students engage in fewer EPs than the higher education students. The results also show that it is possible to use MNs as an instrument to develop research on teachers’ pedagogical decisions. Teachers’ pedagogical decisions are an important asset for teacher professional development as they have an impact on students’ epistemic work in the physical science classroom.

INTRODUCTION

Decisions are present in almost everything that humans do, either in their personal or professional lives (Edwards & Fasolo, 2001). Teachers are no exception and as noted by Shavelson (1973), any act of teaching is a decision, so it is easily inferred that the teacher makes many decisions throughout the entire teaching process (Shavelson & Stern, 1981). Teachers’ decisions include three distinct phases, which take place at different moments in the teaching process (e.g., Shavelson & Stern, 1981). They can occur in the lesson planning phase, during the interaction in the classroom, or after it has happened (i.e., after the lesson) (e.g., Shavelson & Stern, 1981). In this study, we focus only on the teachers’ decisions that take place inside the classroom, which for simplification we call “pedagogical decisions.”

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Students’ epistemic practices (EPs) are important in developing competences (Lopes, Branco, & Jiménez-Aleixandre, 2011), and for promoting the construction of scientific knowledge (e.g., Berland et al., 2016; Driver, Asoko, Leach, Scott, & Mortimer, 1994) in the science and technology classroom; this can effectively be used in a huge variety of contexts or situations (Kirschner, van Vilsteren, Hummel, & Wigman, 1997).

The study of pedagogical decisions and students’ EPs requires data analysis related to the practice of teaching, which generates a large amount of data, making its analysis very time consuming. Grouping all the data collected in the classroom and turning them into a single analytical instrument is possible through the use of multimodal narratives ([MNs], Lopes et al., 2014), facilitating research. Similarly, one may exploit MNs as a tool preserving the holistic nature of teaching and the natural environment of the classroom (Lopes et al., 2014). The great added value of MNs, which we wish to highlight in the context of this work, is that they have the same structure, they are focused on the development of the proposed tasks in the classroom, they are narrated from the perspective of the teacher, and they enable comparison of multiple case studies (Lopes et al., 2014). Even if they are elaborated by different teachers or researchers, as they have the same structure, they are comparable and verifiable (Lopes et al., 2014), facilitating the adoption of methodological approaches such as content analysis. In this particular case, we intend to investigate the ways in which the use of MNs allows access to information regarding all the actions and decisions of each of the teachers and the students’ EPs at the different teaching levels in the context of the classroom.

Teachers’ pedagogical decisions are an important asset for teacher professional development since they have an impact on students’ epistemic work in the physical science classroom. We studied lessons that took place in identical teaching contexts with privileged inquiry methodologies, and in which experimental work took place. The interpretative analysis (Cohen, Manion, & Morrison, 2011) of this research was undertaken through the MNs related to the lessons taught by two teachers in the area of physical sciences. The study of the interactions between teacher’s pedagogical decisions and the students’ EPs at different teaching levels can help to understand the mutual influence of these interactions.

Thus, the objective of this study was to identify the interaction between pedagogical decisions adopted by teachers and the students’ EPs in two different teaching contexts. We present excerpts from the MNs that highlight these pedagogical decisions and the students’ EPs.

BACKGROUND

According to Kennedy (2006), during the planning phase, the teacher imagines how the class will be conducted and how all associated actions will occur. However, no matter the extent to which a teacher plans the lesson, there are always decisions that have to be taken in the classroom to address challenging situations that arise (Aho, Haverinen, Juuso, Laukka, & Sutinen, 2010), regardless of the teaching level. However, given the specificities of each teaching level, there may be a set of decisions more characteristic of one level than others (Santos, Lopes, & Cravino 2011).

Pedagogical decisions are not always interpreted by teachers as a decision, but as their way of acting in the classroom. Sometimes the teacher takes decisions without being aware of the act, but even when taken spontaneously, such action is characterized as a result of a decision (Shavelson, 1973). This can be explained by the fact that teachers during their work act “without thinking about it” (Roth, Masciotra, & Boyd, 1999, p. 771). It may also happen because the act of deciding is inherent to every human and
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