Teachers’ talk about genetics: how do they explain the central concepts and make connections between the micro- and macro-levels?

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Abstract

Scientific knowledge about genetics has increased dramatically over the last fifty years, and this new understanding influences modern society in countless ways. It’s essential therefore, for schools to effectively educate students with the basic knowledge of genetics that will help them make informed decisions throughout their lives. Unfortunately, students find genetics to be one of the most difficult topics in biology (Bahar et al., 1999). Several categories of difficulties in genetics education have been identified; two important categories are: 1) the complex and domain-specific vocabulary and terminology, and 2) the conceptual difficulty of going from the micro- (DNA) to the macro- (e.g. phenotype) level (Knippels, 2002). The connection between these levels is far from obvious for the students. Although much research has been undertaken concerning students’ understanding of genetics (e.g. Lewis & Kattman, 2004; Lewis & Wood-Robinson, 2000; Venville et al., 2005) there are fewer studies that have focused on classroom situations and what is actually communicated by the teachers. For science learning in general, several researchers have stressed the important role of language (Lemke, 1990; Mortimer & Scott, 2003; Ogborn et al., 1996). Based on a Vygotskian perspective, Mortimer and Scott (2003) emphasize the important role that the teachers have in fostering pupils to master the typical language of school science with its specific terms and style of talking, i.e. the social language of school science. The complex terminology in genetics indicates that the role of teachers’ communication may be particularly important and it has been suggested that teachers should use terms selectively and with care so as to not to confuse the students (Pearson & Hughes, 1988). There have been few studies, however, about how teachers communicate genetics to their students. My research will focus on the content of teachers’ talk during
genetic lessons. Specifically, how teachers explain the micro-level concepts of DNA, gene, and chromosome, and how they relate these to macro-level concepts such as visible trait. This study has a naturalistic approach, defined as collecting naturally occurring data (Robson, 2002 p.549). Data were collected through observations as well as audio and video recordings in four different 9th grade classes, through the whole teaching sequence of genetics. The teachers are qualified biology teachers with at least five years experience. All recordings are transcribed, and categories are developed in an inductive process. Preliminary analyses indicate that the concepts are not explained in a consistent way throughout the lessons. When teachers explain the relation between micro- and macro level, they often connect gene to trait, without explicitly referring to protein synthesis. The teachers also use the terms trait and gene as synonyms. This will need to be confirmed after the analyses of the whole study have been completed.

References