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5. TEACHER SUPPORT IN TECHNOLOGY-BASED SCIENCE LEARNING

Balancing Procedural and Conceptual Support in Students’ Learning Processes

INTRODUCTION

This chapter focuses on the support provided by a teacher in a setting where primary school students worked on a technology-based science project. This setting involved open-ended tasks to be solved through project work, peer collaboration, and the use of various information resources. In today’s schools, this type of instructional setting is quite common, which makes them interesting to study. From an early age, students are exposed to conceptual tasks that pose complex multidisciplinary problems, usually involving integration of relevant information by the use of multiple digital and non-digital resources. These types of learning activities, which encompass a high level of student engagement, are referred to as exploratory or inquiry-based activities. In naturalistic classroom settings, the teacher most often acts as an important resource and provides various forms of guidance during students’ learning activities. Nevertheless, several researchers have pointed out that rather few studies focus on the role and significance of dialogue-based teacher support in technology-based learning settings. The underlying claim of the current study is that more knowledge is needed about the teacher’s role in these types of settings. By taking a dialogic approach (Linell, 2009; Vygotsky, 1986), the study aims to further explore the role of teacher support in technology-based learning in science education by directing the analytical attention towards various forms of teacher support, and their potential roles in facilitating students’ development of conceptual understanding.

Studies focusing on classroom dialogues have shown that various forms of teacher support are essential for students’ development of conceptual understanding; in particular, two pivotal forms are conceptual and procedural support (Furberg, 2016; van Leeuwen, Janssen, Erkens, & Brekelmans, 2013). Conceptual support refers to guidance by helping students make sense of the scientific content (i.e., the concepts or processes) associated with the scientific theme of the project, activity, or assignment. In other words, it involves conceptually oriented talk that directs the...
students’ and the teacher’s attention towards making sense of conceptual issues. As will be discussed in more detail in the review section, teachers may apply several strategies when providing conceptual support. Procedural support involves guidance by helping students regulate their work processes. For instance, this might involve aid in task planning, structuring their work process, finding relevant information, dividing labour between students, and regulating time. The teacher uses both forms to facilitate students’ development of conceptual understanding. An underlying premise of this study is that the two support forms are to be seen as analytical concepts, implying that they do not necessarily exist as clear-cut entities. In everyday classroom dialogues, the teacher provides both conceptual and procedural support to the students, and often within the same dialogical sequence. The interesting point is to identify what can be seen as patterns in the teacher’s way of supporting students, as well as how the teacher balances the forms of support within different activity forms of the technology-based science project.

The empirical basis for the current study is a science project about “health and the human body” involving fifth-grade primary school students (aged 10–11) and their teacher. Central themes were the heart and lung functions and the blood circulation system. The learning activities involved a combination of whole-class activities, individual seatwork, and group work. The students used various digital information resources available through their personal iPads. In order to explore the complexity of facilitating students’ development of conceptual understanding in these types of settings, we performed detailed analyses of selected student – teacher interactions taking place within the various learning activity settings. We directed the analytical attention towards student – teacher interactions within various activities because such interactions display the challenges experienced by the students as well as the teacher’s responses to those challenges. The following research questions guided the analyses:

- What types of student challenges emerge in the various settings?
- What types of support does the teacher provide within the various learning activities?

Before we enter the empirical analysis section, we will present and discuss relevant findings from previous studies focusing on teacher support in computer-based learning settings. Subsequently, we will account for the underlying sociocultural perspective that forms the underlying premise for our view on teacher support, as well as the applied analytical procedures (Mercer, 2004; Säljö, 2010; Vygotsky, 1978). Then follows a section where we will outline and discuss methodological issues. The analysis section constitutes the hearth of the chapter, comprising detailed analyses of selected excerpts of student – teacher interactions taking place during the science project. The chapter will conclude with a discussion section addressing the empirical analyses in light of the findings from previous research.