

## Chapter 7

# The Role of ICTs in Primary Science Education in Developing a Community of Learners to Enhance Scientific Literacy

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### ABSTRACT

*The purpose of this chapter is to show how information communication technologies (ICT) facilitated communication between primary pre-service teachers that enabled a 'community of learners' to develop children's scientific literacy. Cultural-historical theory was used to frame a study that sought to explicitly go beyond thinking as being individualistic, and to show how thinking can also be considered as a collective endeavour. In particular the study identifies how thinking forms part of a 'community of learners' both virtually and in reality within classrooms. The study was able to make visible child and pre-service teacher interactional sequences that brought together everyday concepts and scientific concepts to support concept formation in science. The study revealed the dialectical relations between everyday concepts and scientific concepts for moving from an interpsychological level to an intrapsychological level. The collective, rather than the individual orientation, made such a perspective possible. Importantly, the use of ICTs facilitated communication between members of the collective.*

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## INTRODUCTION

Learning in most Western communities has traditionally been conceptualized within the framework of the individual and the collective (see Rogoff, 2003), and this kind of dualistic thinking can also be found within the literature and everyday discourses surrounding virtual technologies. Schultze and Rennecker (2007) argue that ‘virtuality-reality’ dualisms cast a divide between the synthetic world and the world of reality, and this type of framing is unhelpful because it places them in opposition to each other. Their work suggests that the interface between reality and the virtual world should be the focus of attention in research. In building upon this research trajectory, the literature also points to the need for a re-conceptualization of the pedagogy that is afforded by the interface between the worlds of virtuality and reality (see Wei, 2007). These writings are important for understanding the broader sociological and philosophical arguments about the market/service economy, the place of digital technologies, and the dialectical interactions they afford (particularly Baudrillard’s 1988 earlier critiques of a Marxist capital economy). Whilst we have been inspired by these philosophical and sociological critiques, we believe they do not go far enough in teasing out the relations between psychological functioning and the potential pedagogical interface afforded through the dialectical relations between virtuality and reality.

In the study reported in this chapter the dynamic interface between reality and the synthetic world is framed from a cultural-historical perspective. The study aimed to examine the dynamic interface between the reality of classroom teaching in science with young children, and the pre-service teachers’ accounts and analyses of this as a learning community in the virtual world of WebCT. In particular, we seek to make visible the psychological functioning of the children in the classrooms alongside that of the pre-service teachers as operationalised through the pedagogy

they enact in classrooms. Learning in science is explored, not from an individualistic perspective, but from a ‘community of learners’ orientation (Lave & Wenger, 1991). In particular, the case study described here shows how ICTs, when integral to assessment, can assist pre-service teachers to enhance the scientific literacy of children. Cultural-historical theory was used to frame the study that sought to explicitly go beyond thinking as being located within the individual child, by identifying how thinking forms part of a ‘community of learners’. In the first section of the chapter the theoretical perspective is presented, and a description of the study design follows.

## INTRODUCTION

The influential writing of Vygotsky (1987) showed that to understand a particular individual requires an understanding of the cultural-historical context pertaining to that individual. Cultural-historical theory highlights those contexts that shape social relations, community values, and past practices that in turn influence what participants pay attention to in their communities. When considering issues in science education some relevant Vygotskian concepts are mediated action, psychological functioning, and everyday and scientific concepts.

## MEDIATED ACTION

Law and Bijker (1992) argue that people and structures are *both* products, “they are created and sustained together” (p. 293). That is, they are dialectically related to each other. Traditionally, they argue that either people or structures have dominated the explanation for why things are the way they are in society. For instance, Wajcman (1991) contends that many believe that the technology determines and shapes people - a technologically deterministic perspective. However, others have

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