ABSTRACT. The purpose of this study was to enhance the teaching and learning of matter and its properties for grade 6 students. The development of a conceptual change approach instructional unit was undertaken for this purpose. Pre- and post-concept surveys, classroom observations, and student and teacher interviews were used to collect data. The teaching activities not only challenged and encouraged students’ conceptual change but also indicated that teachers needed to develop their content knowledge and teaching strategies. The participants developed more scientific conceptions and were able to apply these in appropriate contexts. This study illustrates how a conceptual change approach can be accomplished in the Thai context.

KEY WORDS: conceptual change, matter and its properties, primary level

INTRODUCTION

Currently, a number of countries around the world are reviewing their science curricula to meet two main concerns. The first concern involves the number of students continuing on to study science at the tertiary level. The second concern is to ensure that all students in the compulsory education system develop a reasonable level of scientific literacy. These two concerns are also reflected in the 1999 revision of the Thai curriculum where its primary aim is to produce students that are scientifically literate. It was recommended that students’ experiences of science be varied and responsive to the demands of their communities so that they can experience science as a meaningful and applicable subject for use in their daily life and in college (ONEC, 2000; IPST, 2002).

Research studies over the past 30 years have shown that students hold many alternative conceptions about matter. For example, some students may believe that water moves to the sky or space when it evaporates or boils, while others believe that its particles transform into gas (Cosgrove & Osborne, 1981; Bar & Galili, 1994). In general, students do not realize that a new substance is formed in chemical reactions. Research has found that many students do not accept that mass and energy do not change with
physical and chemical changes (Lee, Eichinger, Anderson, Berkheimer & Blakeslee, 1993; Andersson, 1990; Stavy, 1990; Pireto, Watson & Dillon, 1992). In Thailand, a handful of studies have examined Thai students’ conceptions of matter and found that students held some alternative conceptions about matter, especially more abstract concepts (Chantanapitan, 1997; Sangaunsin, 2005; Savanakunanon, 1993). For example, most students were unable to differentiate gases from liquids because they could not explain the different physical properties of gases and liquids. Some students could not explain the relationship between evaporation and condensation and some considered that the size of the molecules in each phase of matter was different. This study reports on a study that investigated and then focused on promoting Thai grade 6 (11–12 years) student conceptions related to matter and its properties.

**BACKGROUND TO THE STUDY**

Traditional views of conceptual change that stress the promotion of student dissatisfaction with existing concepts and the introduction of new concepts which make sense are accepted and found to be valuable (Posner, Strike, Hewson & Gertzog, 1982). Posner et al. (1982) were interested in accommodation and identified the conditions which were necessary for this type of conceptual change. They argued that students must first become dissatisfied with their existing conceptions through experiences which show that their existing conceptions cannot solve problems. Secondly, they must have access to a new conception that is intelligible or makes sense to them. Thirdly, the new conception must appear plausible or appear to have the ability to solve the problems. Finally, the new conception must be fruitful; it must be able to solve future problems for the students. The focus of the four conditions of conceptual change is related to the notion of conceptual ecology. Posner et al. (1982), Strike & Posner (1985, 1992) proposed that conceptual change is influenced by the individual’s current concepts, or conceptual ecology, which include anomalies, analogies and metaphors, exemplars and images, past experiences, epistemological commitments, metaphysical beliefs, and knowledge in other fields. However, they do not explain the interaction between students existing conception and the new conceptions (Duit, 1999). Hewson & Hewson (1992) defined the meaning of conceptual ecology as consisting of the different kinds of knowledge that each student holds (i.e. a student s’ conceptual ecology can support some concepts and discourage others). They also presented another factor