LEARNING IN INTERACTIVE SCIENCE CENTRES

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ABSTRACT

The potential of informal sources of science learning to supplement and interact with formal classroom science is receiving increasing recognition and attention in the research literature. In this study, a phenomenographic approach was used to determine changes in levels of understanding of 27 grade 7 primary school children as a result of a visit to an interactive science centre. The results showed that most students did change their levels of understanding of aspects of the concept "sound". The study also provides information which will be of assistance to teachers on the levels of understanding displayed by students on this concept.

INTRODUCTION

It is being increasingly recognised that children's science learning occurs from a variety of sources outside the classroom and that these learning sources have the potential to interact with classroom science learning (Schibeci, 1989; Wellington, 1991). Formal science learning in classrooms is distinguished from informal science learning by authors in different ways (Lucas, 1983; Maarshalt, 1988). A further distinction is made between intentional and unintentional sources of informal science learning, it being seen as intentional when the aim is to teach as in museums and interactive science centres and unintentional as in television programs, fiction and other media such as newspapers (Lucas, 1983). Others refer to interactive science centres and museums as nonformal sources of science learning and the discussion that occurs outside the classroom about the science that is discussed in classrooms as informal science learning (Maarshalt, 1988).

One of the success stories of the last decade has been in the growing interest in and increasing number of interactive science centres established as places of public learning. Early criticisms of such centres were that they constituted places of fun and entertainment but that very little learning was believed to occur (Shortland, 1987). Further studies showed that visitors approached science centres with a variety of intentions including the intentions to enjoy, to learn and to have a family outing, so that the intention of the visitor was also an important factor in whether learning occurred (Lucas, McManus & Thomas, 1986).

Studies on interactive science centres have shown that the intellectual involvement of participants increases with hands on involvement (Koran, Morrison, Koran & Gangara, 1984; Blud, 1990), that they develop positive attitudes to science and they that are enjoyable experiences (Feher, 1990; McManus, 1985). Previous studies have also shown that some learning does occur during interactive science centre visits (Russell, 1990; Tuckey, 1992; Wellington, 1991) but that there is still a need for further studies to investigate the increase in understanding resulting from such visits (Finley, Lawrenz & Heller, 1992; Russell, 1990). Also, many of these studies employed traditional testing instruments which only categorise learning and understanding dichotomously, rather than on a continuum showing different levels of understanding (White & Gunstone,
Further, Wellington (1991) considers it "surprising that children's informal science learning in science, with its acknowledged influence on pupils and its potential for classroom enrichment, remains a relatively under-valued and under-researched area" (p 364).

The present study investigated the change in understanding of aspects of the concept "sound" that occurred as a result of a visit by primary school students to an interactive science centre. The objectives were to investigate the levels of understanding of aspects of the concept "sound" held by grade 7 students, and to investigate the change in understanding that occurred in these levels of understanding as a result of a visit to an interactive science centre.

**METHOD**

The sample consisted of 27 grade 7 students (14 boys and 13 girls) randomly selected from two classes of a suburban Brisbane primary school. Practice was given in drawing concept maps (including the concept of "sound") over several weeks before the study began to reduce practice effects during the study. Children were assessed on their understanding of this concept approximately one week before the visit to the interactive science centre by a structured interview and by their drawing of a concept map.

The science centre featured a whole floor of 13 exhibits dedicated to this concept. These exhibits involved the five aspects of sound as shown in Table 1. The interview was based around these aspects of the concept and stimuli were selected so as to provide the students with an opportunity to display their levels of understanding relating to them. The stimuli selected are also reported in Table 1. Pen and paper were available and hand gestures, as for example in the description of waves, were also noted. The interviews were audiotaped and transcribed. The children visited the centre for 75 minutes. They interacted with the exhibits in pairs with freedom to explore in any order. While this is acknowledged as a limited exposure to the exhibits, it represents the typical time allocation most students would receive to see such a set of exhibits when visiting with their primary school class. One week after the visit to the science centre, the children redrew a concept map and were again interviewed using the same stimuli to assess their understanding of this concept.

**ANALYSIS AND RESULTS**

Phenomenography is a qualitative research method which is concerned with "discerning and describing the qualitatively different ways people experience the world " (Marton, 1981). It involves recording the responses to questions about a concept and dividing those responses into the qualitatively different ways in which it is conceptualised. These conceptions are termed categories of description (Marton, 1981; Marton & Saljo, 1984) and are not predetermined but created as a result of examination of the interview protocols (Van Rossum & Shenk, 1984; Johansson, Marton & Svensson, 1985). The method rests on the assumption that there are a limited number of categories that students use in conjunction with particular concepts (Johansson et al., 1985; Marton, 1988).

Categories were determined from the interview data using an interpretive nonalgorithmic method (Marton & Saljo, 1984). In this preliminary analysis, the most parsimonious result was to develop one set of categories for the production of sound and another for the transmission of sound. The resulting categories of description are reported in Table 2 along with some explanatory examples of the kinds of responses typical of particular categories.