ABSTRACT. It is over 25 years since Wood, Bruner and Ross (1976, Journal of Child Psychology and Psychiatry, 17, 89–100) introduced the idea of 'scaffolding' to represent the way children's learning can be supported. Despite problems, this metaphor has enduring attraction in the way it emphasises the intent to support a sound foundation with increasing independence for the learner as understanding becomes more secure. It has resonance with the widely accepted notion in teaching of construction and the constructivist paradigm for learning. The discussion that follows will characterise some teaching approaches that can be identified as scaffolding, revisiting some of the original classifications, and identifying further scaffolding strategies with particular reference to mathematics learning. Examples will be given from studies relating to geometry learning with four to 6 year olds and to arithmetic learning with older pupils.

KEY WORDS: classroom interactions, explaining, mathematics, scaffolding, teaching and learning

Mathematics teaching is informed by the social constructivist paradigm for the teaching–learning process in which 'students actively construct meaning as they participate in increasingly substantial ways in the re-enactment of established mathematical practices' (Cobb, Yackel, & McClain, 2000 p. 21). Marked changes from traditional teaching approaches are needed as the role of the teacher changes from 'showing and telling' to responsive guidance in developing pupils' own thinking. This guidance requires a range of support for pupils' thought constructions, in a way that develops individual thinking as well as leading to the generation of mathematically valid understandings. Teachers work to establish classroom practices in which patterns of instruction are established to support this learning. The notion of 'scaffolding' has been used to reflect the way adult support is adjusted as the child learns and is ultimately removed when the learner can 'stand alone' (Wood, Bruner, & Ross, 1976). The following discussion is an attempt to identify a hierarchy of interactions which relate to teaching practices that can enhance mathematics learning. Starting with a review of
BACKGROUND

Characterising Scaffolding

Introducing the metaphor of scaffolding to help explore the nature of adult interactions in children’s learning, Wood et al. (1976) identified six key elements:

- recruitment – enlisting the learner’s interest and adherence to the requirements of the task;
- reduction in degrees of freedom – simplifying the task so that feedback is regulated to a level that could be used for correction;
- direction maintenance – (verbal prodder and corrector) keeping the learner in pursuit of a particular objective;
- marking critical features – (confirming and checking) accentuating some and interpreting discrepancies;
- frustration control – responding to the learner’s emotional state;
- demonstration – or modelling solution to a task. (p. 98)

In discussing these, the authors hint at complexities that need further analysis, for example, in demonstrating or ‘modelling’ a solution to a task ‘the tutor is ‘imitating’ in idealised form an attempted solution tried (or assumed to be tried) by the tutee in the expectation that the learner will then ‘imitate’ it back in a more appropriate form’. They go on to propose, “the only acts children imitate are those they can already do fairly well” (Wood et al., 1976 p. 99). This has some resonances with classroom practices and teachers will recognise the role of these supporting interactions.

Again working with the adult as leader in the learning situation, Tharpe and Gallimore (1988) use the term ‘assisted learning’ to develop the classification of adult interactions and identify six interdependent strategies:

- modelling – offering behaviour for imitation;
- contingency management – rewards and punishment arranged to follow on behaviour;
- feeding back – information resulting from experiences;
- instructing – calling for specific action;
- questioning – calling for linguistic response;
- demonstration – or modelling solution to a task. (p. 98)