

The proposed research question is “how and to what extent do manipulatives impact upon pupil learning and engagement in mathematics?”.

Manipulative materials are any concrete objects that allow students to explore abstract concepts in an active, hands-on approach (Cope, 2015). Manipulatives are used in maths to represent, clearly and concretely, mathematical ideas that are otherwise abstract (Moyer, 2001). Disregarding the use of manipulatives, progressing immediately to abstract concepts, takes away opportunities for learners to make sense of an abstract concept for themselves (Hoong et al., 2015). Therefore, without the use of manipulatives, learners are likely to find it more difficult to develop an adequate base of understanding abstract concepts. Manipulative materials include, but are not limited to, multilink, counters, and number lines. Manipulatives are widely described as crucial to the development of mathematical knowledge (Ball, 1992); however, these manipulatives are often not used effectively (Ofsted, 2012). According to Piaget (McLeod, 2018), children in Key Stage 2 would be in the concrete operational stage of development as the proposed age for this stage is seven to eleven. During this stage, pupils can think more logically if they can manipulate materials in order to solve problems. Therefore, at this age, abstract concepts may not be accessible for learners.

Petress (2006) suggests that active participation is an integral part of the learning process. A Chinese proverb says, “I hear and I forget, I see and I remember, I do and I understand” (Horton, 2001). This suggests that audio and visual instructions or modalities alone will not significantly benefit the learners. Instead, pupils should be actively involved in their learning in order to gain a deep understanding. Moyer (2001) states that manipulative materials have both visual and tactile appeal which allow pupils to learn through hands-on experiences. Research conducted by Heddens (1997) found that manipulative materials help pupils to grasp mathematical concepts by appealing to different senses. Kelly and Phillips (2016) support this stating that using a combination of senses aids in developing and strengthening neural pathways within the brain.