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VISUALISATION IN MATHEMATICS LEARNING: CANONICAL IMAGES AND SEMIOSIS

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In this study, Presmeg (2006) has been followed in using semiotics – the study of the meaning of language, symbols and signs – as a theoretical perspective. A sign can be classified as either iconic, indexical or symbolic.

The term canonical image is used to describe an image that is *economical* in that it gives direct access to the mathematical concept (Breen, 1997). An example of a canonical image is the unit circle image for trigonometry. Another possible definition for a canonical image is an image that affords the flexibility to be used directly in a number of ways with a variety of problems – an image that can be described as iconic, indexical *and* symbolic.

The study was based on six 18-year-old students; five male and one female. The students were video-taped working in pairs on a set of mathematical problems and what was particularly significant was their use of hand gestures.

The data collected showed evidence of "semiotic nodes" (Radford *et al.*), that is, "pieces of the students' semiotic activity where action, gesture, and word work together to achieve knowledge objectification" (p. 56). There is evidence that iconic gesturing (mimicking) and indexical gesturing (pointing to diagram) were being used, which in turn demonstrated the objectification of the mathematical relationships being dealt with. Students were accessing the canonical image for trigonometry to allow them to answer problems on complex numbers and on general trigonometric solutions. This flexibility is illustrated through the different forms of gesturing.

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