Abstract

Statistical investigations is a major strand of the New Zealand statistics curriculum. A preliminary study identified the initial problematic situation that some year 10 students (ages 14–15) were unable to complete a statistical enquiry because their question, which the teacher had approved, was unsuitable for the multivariate data set they were investigating. An understanding about key concepts underpinning statistical questions seemed to be lacking. A subsequent review of the literature failed to find criteria for what makes a good statistical question. Hence the research topic for this thesis was established: what makes a good investigative question, and developing links between the investigative question and the analysis and conclusion.

Using a design research method, four teaching experiments were conducted over a period of five years. Each experiment involved one year 10 class and altogether 93 students and two teachers from two mid-decile multicultural schools participated. From the initial identified problematic situation, a teaching experiment was planned which involved identification of underpinning concepts and development of innovative prototypical instruction material; the teaching plan was then implemented. Data collected were student pre-and post-tests, interviews and class transcripts, which provided insights into student reasoning and which fed back into the next teaching experiment.

The main findings from the research were: (1) identification of the criteria for what makes a good question and for describing distributions; (2) explication of the conceptual infrastructure that students need for investigative questions, making a call, and distributions; and (3) promising indications that the implementation of the especially developed learning materials designed to build concepts such as variable, sample, population, sampling variability, and distribution, improved students' reasoning processes. Frameworks to describe concepts and to assess the level of student reasoning for investigative questions, making a call, and distributions were developed from the literature and data. The main themes that emerged from the research were the necessity for concept identification, concept development, particular learning and teaching approaches, and building knowledge about student learning, when attempting to engineer a new paradigm for enculturating students into new ways of thinking statistically. The implications of these findings are that teachers will need extended professional learning to meet the demands of the new curriculum.