Understanding the knowledge demands of teaching statistics: Insights gained from examining practice

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This research examines the knowledge demands placed on 73 pre-service teachers who are observed as they plan, teach and re-teach data lessons in classrooms. Problems of practice are identified and categorized using the Ball, Thames and Phelps (2008) subdomains of common content knowledge (CCK), specialised content knowledge (SCK), knowledge of content and students (KCS) and knowledge of content and teaching (KCT). The results provide insights into the specific knowledge demands placed on early career teachers when teaching data and statistics and identifies the ways in which these knowledge demands are revealed as pre-service teachers engage in Japanese Lesson Study. The results illustrate that development of understandings in one knowledge subdomain can motivate and impact learning in another subdomain. These interrelationships were found to exist both within and between the domains of content and pedagogical content knowledge.

Keywords: Teacher knowledge, statistics, teacher education, lesson study.

BACKGROUND

The publication presents the research findings on the knowledge demands of teaching elementary school data lessons and illustrates how particular stages of the research process (Lesson Study) provides insights into specific subdomains of knowledge required to teach statistics.

THEORETICAL PERSPECTIVE

This research uses the Ball and colleagues' (2008) practice-based theory of content knowledge for teaching to identify the mathematical knowledge needed for teaching primary level statistics. These insights into the knowledge components of statistics teaching were generated from looking at *teaching in action* in classrooms and are motivated by the belief that the knowledge teachers need to teach well is embedded in practice (what Cochran-Smith and Lytle (1999) term 'knowledge-in-practice'). Hence the study uses the classroom as the unit of analysis. It is through using the mathematics lesson, and its enactment, as the focus of pedagogical and mathematical inquiry, that insights into particular knowledge demands placed on teachers when teaching statistics are revealed.

METHODOLOGY

The use of lesson study (Lewis & Tsuchida, 1998) provides an avenue to reveal knowledge demands as they arise in the context of planning and teaching primary level data handling lessons. This paper reports on the findings from three years of research carried out with 73 Irish pre-service primary teachers , detailed findings can be sourced from the original publications (Leavy, 2015; Leavy, 2010).

SUMMARY FINDINGS

- The research revealed was the complexities of teaching statistics for early career teachers in particular in terms of the wide and varying knowledge demands placed on them.
- The knowledge needed for teaching primary level data needed to be more flexible, robust and interconnected. Evidence of knowledge needs arose in the pedagogical knowledge subdomains of *knowledge of content and students* and *knowledge of content and teaching*.

— Addressing knowledge demands as they arose in one knowledge domain lead to development of understandings in the other. Attention to pedagogical knowledge (in this case *knowledge of content and teaching*) lead to knowledge developments in 'pure' content knowledge (in this case *specialized content knowledge*).

— Tackling the questions and misconceptions posited by the children, and reconsidering teaching activities and representations in light of these questions, precipitated pre-service teachers in really tackling and unpacking (Ma 1999) their own content knowledge understanding of statistical concepts.

— Lesson study as a valuable site for examination of the knowledge demands of teaching statistics.

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