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Grade 11 learners' and teachers' conceptions of scientific inquiry in relation to instructional practices.

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Abstract

This exploratory, descriptive and interpretive study investigated the interactions among learners' conceptions of the nature of scientific inquiry (NOSI), teachers' conceptions of NOSI and teacher instructional practices when teaching investigations in Physical Science. The participants were South Africa, Grade 11 learners (n= 167) and teachers (n=5), from five schools in the Johannesburg region of South Africa. The schools were conveniently and purposefully sampled. Learners' and teachers' conceptions on six NOSI tenets were investigated. These tenets are: difference between laws and theories; difference between observation and interpretation; there is no one method in science; accurate record keeping, peer review and replicability in science; socially and culturally embeddedness nature of scientific knowledge; and the role of human creativity and imagination in the development of scientific knowledge. Data on learners' and teachers' conceptions of the NOSI was obtained through; questionnaires, probes and interviews. Teacher instructional practices were determined using laboratory class observations, questionnaires, teacher and learner interviews, and analysis of instructional materials. The data was quantitatively analyzed using mainly, descriptive statistics, correlations, Regression Analysis and Multivariate Analysis of Variance (MANOVA). Qualitative data was analyzed using a combination of analytic induction and interpretive analysis. The results show that learners' NOSI conceptions were inconsistent, fragmented and fluid, with the majority of the learners displaying naïve conceptions. Teachers were found to hold mixed NOSI conceptions ranging from static, empiricist-aligned to dynamic, constructivist-oriented. Teacher instructional practices were found to be a repertoire of contrasting methodological approaches lying along a continuum ranging from *close-ended* inquiry to *open-ended* inquiry. The study found the interactions between and among the investigated variables to be weak and not direct and simple, but complex and under the governance of a variety of factors in the instructional milieu. Curriculum and assessment demands were found to be major factors possibly responsible for weakening the interactions. For the investigated variables, it is posited that the interaction between variables is under the governance of both the context in which the instruction takes place and some factors already embedded in the teacher's or learner's conceptual ecology. Recommendations and implications for the practice of science education and future research are raised and discussed.

Key Words

scientific inquiry, instructional practice, nature of scientific inquiry, conceptions of NOSI, investigations, teachers, learners, Physical Science, interactions