

## Epistemological access in a science foundation course: a social realist perspective

This dissertation examines how educational practices of a multidisciplinary, integrated science foundation course, Introduction to Science Concepts and Methods (ISCM), at Rhodes University in South Africa, enable and/or constrain epistemological access to a range of mainstream science disciplines. Students in the ISCM course are mainly African, working-class, first-generation higher education learners whose home language is seldom English. This study is motivated firstly by poor success of working-class African students in higher education in South Africa in general and in the sciences in particular, and secondly by the need for closely theorised, empirical work to guide necessary transformational change that will contribute to equity and, thus, to greater social justice. Since I teach in ISCM and coordinate the programme in which it is located, I also have a personal and professional interest in improving my own practice. Conceptually the study draws on Morrow's (2007, 2009) and various literacy theorists' interpretations of the concept of epistemological access, which in this study is about becoming and being a participant in an academic practice by virtue of learning both the knowledge as well as the norms, values and beliefs that constitute the practice. Theoretically and analytically the study draws on Maton's (2014a) Legitimation Code Theory (LCT) and on various aspects of Bernstein's (2000) code theory work. Codes are the organising principles or 'rules of the game' of practices and code theory is premised on the idea that power and control in education systems manifest themselves through the structural and interactional aspects of educational practices, and therefore have the capacity to include or exclude. Analysing educational practices using code theory enables characterisation of the practices, highlights their underpinning principles, and allows for their effects to be considered. This layered approach to analysis indicates that a critical realist depth ontology serves as an underlabourer to code theory. The desired 'effect' of educational practices in this study, is students gaining epistemological access to science, or science disciplines, in higher education. The overall approach is a single, in-depth, qualitative case study with a primary focus on what is legitimated in ISCM educational practices (curriculum, pedagogy, assessment) and how students respond to these practices. A lesser focus is how ex-ISCM students are responding to educational practices in the first-year, first-semester Cell Biology, Chemistry, Earth Sciences and Physics mainstream courses, and whether they are attaining epistemological access. To examine educational practices in ISCM and mainstream courses data from document analysis, interviews, observations and critical reflections are analysed through developing external languages of description. The two LCT code dimensions of Specialisation (what or who specialises a practice) and Semantics (how meaning relates to context and empirical referents) are used to examine curriculum, Bernstein's (2000) framing of the regulative and instructional discourses are drawn on in considering pedagogy, and an adapted cognitive process level model assists in analysing assessment practices. To examine student responses to educational practices Bernstein's (ibid.) concept of acquisition and realisation rules is used. Since ISCM serves the dual purpose of developing scientific conceptual knowledge, as well as supporting student learning in an academic context, a complex picture of practices and underpinning codes emerges. Based on epistemological concerns of developing students as scientists, ISCM legitimates an epistemic-context knowledge code and a rhizomatic/worldly curriculum code. If students produce the legitimated epistemic-context scientific 'text', they have attained epistemic access. Based on axiological concerns of the learning context, ISCM also legitimates a learning-context knower code. By producing the legitimate learning-context 'text' of an autonomous, self-regulated science learner, students demonstrate they have attained learning-context access. Both forms of access are key for student success, and combined they constitute epistemological access. The findings of the study indicate that framing and legitimation of educational practices in ISCM, by most accounts, should be promoting epistemological access. When epistemological access is not attained in ISCM it is suggested this is likely due to both a code clash at the learning-context level and competing code demands between epistemic-context and learning-context concerns. Poor access in mainstream courses appears to be exacerbated by both a narrow-based knowledge code and little or no support for a learning-context knower code. The study concludes by outlining a two-tiered conceptual model of epistemological access in the sciences based on the mutually integrative components of epistemic- and learning-context access. Because of

inequitable outcomes in science mainstream courses at Rhodes University based on race and/or class I argue for far-reaching transformative pedagogies throughout the faculty, and in the broader South African science higher education sector, that address and accommodate issues of diversity and difference. This should include, amongst other things, a weakening of epistemic relations to create space for a strengthening of learning-context social relations. This is not a suggestion to move away from a science knowledge code, which I argue is based on powerful knowledge to which all students must gain access, but instead a shift in emphasis to better support previously educationally disenfranchised students and to understand in a more rigorous manner what epistemological access means to them as individuals. In light of the recent disruptive and angry student calls for decolonisation of the curriculum, this is an urgent imperative.