

Chapter 6

Constructivism in Education: Interpretations and Criticisms from Science Education

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ABSTRACT

Constructivism has been widely adopted as a referent for research, curriculum development and recommended pedagogy in education. This chapter considers key issues relating to the adoption of constructivist thinking in education which have arisen within the field of science education. Constructivism has been mooted as a dominant paradigm in science education, where it has informed a major research programme over some decades. However, the application of constructivist ideas in science education has also been subject to a range of critiques. This chapter gives an outline of the developing influence of constructivism in science education, and the common understandings of the term in relation to science teaching and learning; it reports on the main areas where the influence of constructivist thinking has been heavily criticised, and discusses how these criticisms are countered within the research programme; it considers some major directions for research within the research programme; and it evaluates the level of influence of constructivism in contemporary science education practice.

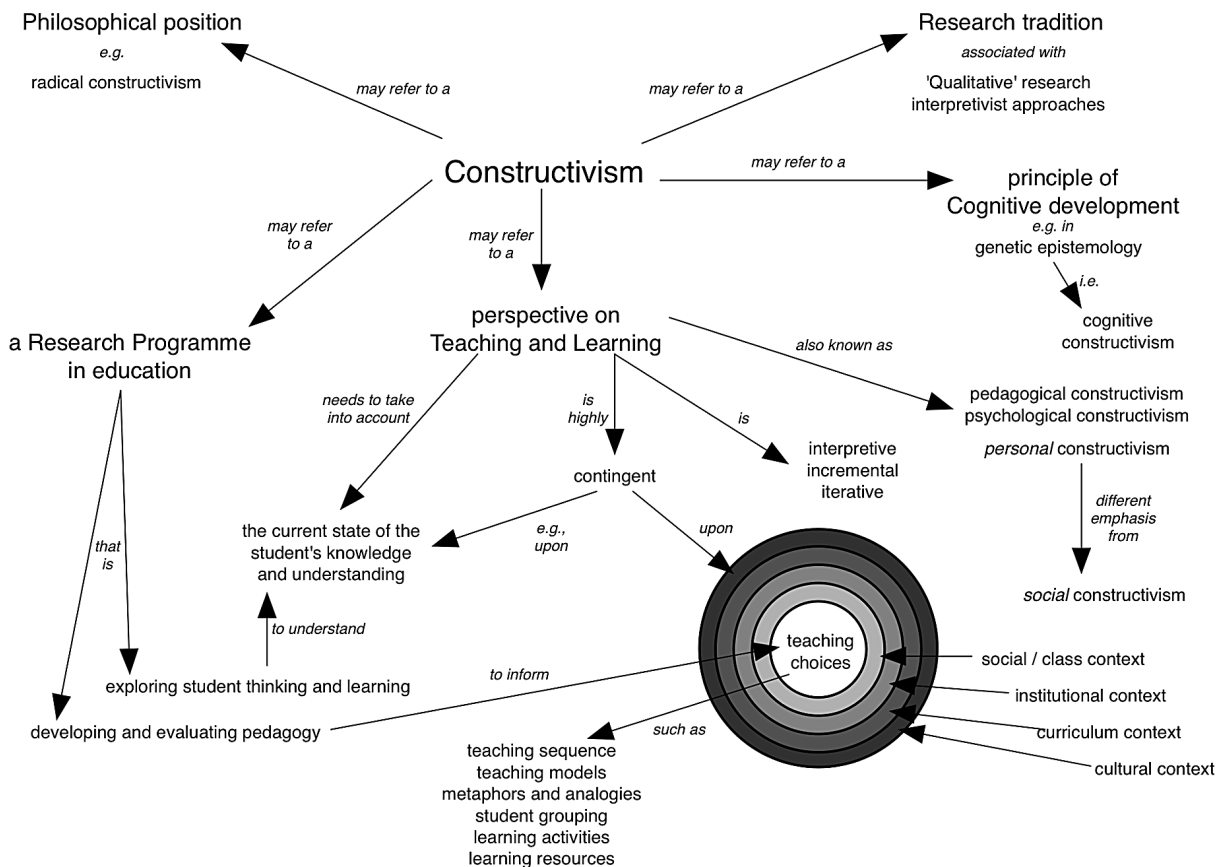
INTRODUCTION

Constructivism is a term that is commonly met in educational and wider social science discourse, although it is used with a range of different meanings and associations relating variously to educational philosophy, research epistemology, cognitive development, learning theory, and approaches to pedagogy (see Figure 1). Constructivism has - or, perhaps more accurately, 'constructivisms' have - been especially influential in science and

mathematics education, although the mantra 'we are all constructivists now' (Wheeler, 1987, p. 57) has been propagated (Brubaker, 2009; Donmoyer, 2012) - and challenged (Bader, 2001; Lesh & Sriraman, 2010) - much more widely. Constructivism is sometimes associated with philosophical and sociological stances that have questioned traditional views of the nature of public knowledge and its 'production'. So a naive notion of the nature and production of scientific knowledge has not only been challenged through scholarship in the

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Figure 1. Constructivism in education



philosophy of science (e.g., see Taber, 2009a), but through the increasing importance of the sociology of knowledge with its focus on the social construction of (what is taken in particular cultural contexts as) reality (Berger & Luckmann, 1991), and which has drawn attention to the social and institutional aspects of knowledge production (Gilbert & Mulkay, 1984; Latour & Woolgar, 1986).

Whilst these debates about the nature of canonical knowledge and how it is acquired are potentially important for fundamental educational questions relating to the purposes of schooling and the structuring and selection of curriculum, the form of constructivism which has arguably had the most impact on classrooms around the world is constructivism as *a perspective on learning that has consequences for how to teach canonical*

knowledge. Constructivist learning theory is certainly not divorced from wider epistemological considerations, but can inform teaching practice without requiring commitment to the more contentious forms of constructivism. This chapter will argue that this is already a common situation in science classes around the world where constructivist thinking on pedagogy has been widely influential. Although the chapter draws upon the specifics of science education - where constructivist influence has been both widespread and often vigorously debated - the 'hard core' premises of the constructivist research programme in science education (as detailed below) would seem to be equally applicable to any area of the curriculum that is concerned with teaching a body of canonical public knowledge (Sjøberg, 2010).

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