Confidence as motivational expressions of interest, utility, and other influences: Exploring under-confidence and over-confidence in science students at secondary school

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ABSTRACT

An enhanced understanding of how students' self-confidence is influenced benefits educational practice and motivational theories. For 1523 students in 12 secondary schools in England, science self-confidence was predicted by various factors: current self-confidence (self-concept) was most strongly predicted by received praise, current grades, and interest in science; self-confidence for future attainment (self-efficacy) was most strongly predicted by current grades and perceived utility of science. For both measures of self-confidence, reported subject-comparisons (science being harder than other subjects) predictively associated with under-confidence, while reported utility predictively associated with over-confidence. Under-confident students reported consistently lower than other students, highlighting that under-confidence may ultimately be motivationally detrimental.

1. Introduction

Self-confidence is integral to psychological theories of motivation (Bandura, 1997; Eccles, 2009) and has practical relevance to education: students' self-confidence has associated with their interest in particular subjects (Viljaranta, Tolvanen, Aunola, & Nurmi, 2014), for example, and with their choices of what subjects to study (Regan and DeWitt, 2015). Students' self-confidence and motivations are then highly relevant to teaching and policy within science education in England and many other countries, especially as higher numbers of science students are sought (The Royal Society, 2014).

Students' self-confidence does not necessarily correspond to their actual attainment, however: reviews have consistently found only modest associations between various indicators of each (Hansford and Hattie, 1982; Zell & Krizan, 2014) and further research has revealed and explored 'confidence biases' towards under-confidence or over-confidence. Under-confidence has generally been inferred or shown to be motivationally detrimental (Bandura, 1997; Bouffard & Narciss, 2011), which has important educational implications; under-confident students may not select subjects that they might otherwise succeed in and enjoy, for example, which may limit numbers of students who study non-compulsory subjects (Sheldrake, Mujtaba, & Reiss, 2014). However, it remains unclear as to what influences may associate with or potentially lead to either under-confidence or over-confidence. An enhanced understanding of the area could lead to practical benefits: someone's degree of over-confidence or under-confidence could potentially be amended via teachers or wider interventions, assuming that the area is sufficiently understood.

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1.1. Conceptualising self-confidence: historical perspectives and prior research

Self-confidence, used here as a simple and intuitive term for inclusivity and brevity, may refer to someone's various beliefs of their abilities and capabilities, which have been formally defined and measured in different ways. Within educational research, self-confidence has often been conceptualised and measured as 'self-concept' and 'self-efficacy' beliefs (Bong and Clark, 1999; Bong & Skaalvik, 2003), usually specific to particular academic subjects. Self-concept broadly considers someone's beliefs about their abilities, integrating historical experiences (such as receiving particular grades or accomplishing difficult work) and current evaluative or interpretative beliefs (such as whether the student is 'doing well' or is 'good' at the subject). Alternately, self-efficacy considers someone's evaluative beliefs about their future capacities, such as their confidence in being able to gain a particular examination grade or to successfully accomplish a particular type of exercise.

Such terms may inadvertently allow misinterpretations: self-concept has no clear relation to someone's identity as conceptualised within science education (e.g. Archer et al., 2010), for example, and research may sometimes use self-concept, self-efficacy, or other terms interchangeably due to varying or unclear definitions (e.g. Marsh et al., 2015b). Using such terminology is nevertheless unavoidable when contextualising against prior research. Expressed more intuitively, self-concept reflects someone's current self-confidence regarding their attainment, while self-efficacy reflects someone's self-confidence for their future attainment. Fig. 1 provides a simple conceptual overview. Historically, however, self-concept and self-efficacy have been considered within relatively-independent research traditions.

Self-concept evolved from general psychological measures (such as self-esteem), rather than within a motivational theory, and was originally conceptualised as a person's perceptions of their self, formed through experiences and interactions with and within the environment (Shavelson, Hubner, & Stanton, 1976). Self-concept was considered to have various characteristics, such as being structured, hierarchical, and being both descriptive and evaluative; however, someone's perceptions of their self are many and varied, and it perhaps remained unclear regarding what, exactly, should be measured. Subsequently, the operationalization of self-concept became increasingly focused on someone's beliefs of their academic ability; for example, interest and enjoyment were originally assumed to be integral but were later considered to be a separate factor (Arens, Seeshing Yeung, Craven, & Hasselhorn, 2011; Marsh, Craven, & Debus, 1999). Nevertheless, higher self-concept has been associated with higher subsequent interest (Viljaranta et al., 2014) and with higher subsequent attainment, sometimes over and above the influence of prior attainment itself (Huang, 2011; Marsh & Martin, 2011), suggesting a potential motivational role for self-concept beliefs.

Students' self-concept has been theorised to be influenced by numerous factors, including mastery experiences (such as gaining particular grades or results), self-comparisons over time, self-comparisons across subjects, comparisons with other students, causal attributions (factors attributed to success or failure, such as being due to the student or being due to outside forces), social persuasions, psychological centrality (how important an area is to the student), and potentially various other factors (Bong and Skaalvik, 2003). Extensive research has focused on particular areas, specifically peer-comparisons (e.g.
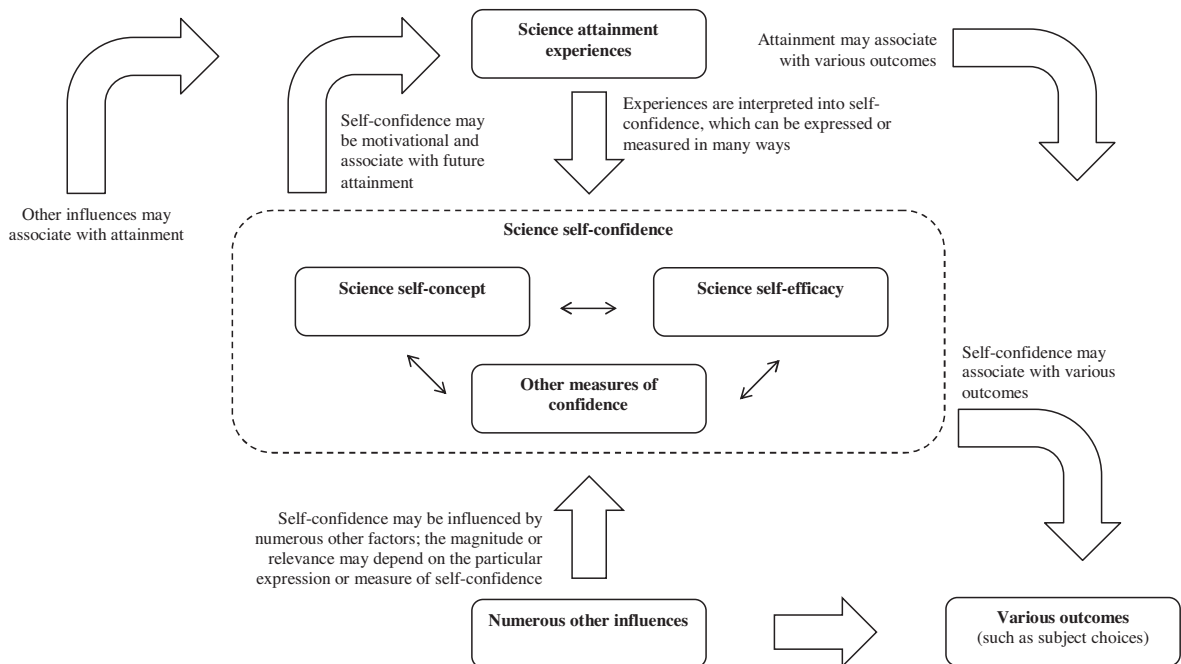

Fig. 1. A conceptual model of science self-confidence.