

Reclaiming creativity in the era of impact: conceptual barriers to creative research in science and engineering (0009)**Background**

Creativity is of great importance for doctoral and postdoctoral researchers (postdocs). Research degree guidelines in the UK state that universities must enable students to make 'judgements requiring creativity' (Quality Assurance Agency 2004). To progress at the postdoctoral stage, advice is given to stand out by 'crafting an application that shows you are creative' (e.g. University of Washington Career Center [2011]). This focus results in a certain amount of pressure to be creative, perhaps felt particularly by junior researchers (PhD students and postdocs) who are the focus of this study. These researchers have relatively limited influence over the direction of their work, operate in a competitive environment and are the focus of many policies (e.g. Roberts 2002). Because research practices vary with discipline, this study is limited to the 'strategically important' science, technology, engineering and mathematics (STEM) disciplines (HEFCE 2004).

There is a long history of research into creativity (see for example Hemlin et al. 2004; Sternberg 1999), yet difficulties in defining creativity persist. In the STEM context, creativity is often defined as that which demonstrates 'novelty' and 'utility' (Amabile 1994; Sternberg and Lubart 1999). However, this definition is problematic since both terms are subjective. In fact it may be more helpful to view creativity as a discursive concept, influenced by both culture and policy.

The discourse of the knowledge economy is currently prominent in policy relevant to higher education. It sees creativity as the core driver of innovation (DIUS 2008; Obama 2011). Creativity is understood as a form of capital, vital to global competitiveness. Universities are considered the optimal location for generation of this resource (Harris 2005). This discourse raises the profile of creativity, emphasising its importance. However, alongside these

developments, universities find themselves in the era of *impact*. Increasingly subject to neo-liberal economic influences, there is a growing imperative to produce knowledge deemed socially and economically relevant (Ozga 1998; Harris 2005). This shift towards the short-term and away from 'blue-skies' research is considered to have a 'deadening effect' upon creativity (Attwood 2010) and to contribute to a 'cult of mediocrity' within STEM disciplines (Angel Medina 2006, citing Fava 2005). This amounts to a second discourse with an implicit message of creativity as liability.

These ambivalent discourses create a complex environment for researchers. This research was part of a larger study which sought to identify facilitators and barriers to creativity in the research environment. However, it soon became clear that an essential prerequisite was to discover the conceptual constructions of creativity held by STEM researchers. This paper reports these findings and examines the implications of certain points of correspondence between researchers' views and the current policy discourses of creativity in higher education.

Methodology

An interview guide was created to explore researchers' concepts of creativity and its role in STEM research. Thirty-five in-depth interviews were conducted with PhD students, postdocs and principal investigators (who were asked particularly for their views on the role of creativity in researcher development). All participants were volunteers and represented a broadly even spread across gender and STEM discipline (science, including medical science, engineering and mathematics). All but three participants were EU nationals. Repeated consideration of the interview data led to the development of a coding framework and a thematic analysis was conducted.

Findings

Many different concepts of creativity existed amongst the sample. The three most recurrent were:

- Creativity as novelty and problem-solving. Problem-solving was considered central to STEM research. This concept was similar to the

'novelty plus utility' definition. However, whereas utility within the impact agenda is defined by immediate applicability, problem solving was a broader concept, including simple advancement of the current research effort, regardless of application.

- Creativity as innovation. This concept was often characterised by a surprising degree of limitation. Innovation operated within disciplinary boundaries and consisted of small advances. It was often juxtaposed with *artistic* creativity which was viewed as free and instinctive compared to science. There was evidence of confusion over the meaning of innovation.
- Creativity as resourcefulness. This was the narrowest definition of creativity. Some saw constraints on resources as opportunities for creativity, but this was merely about practical problem solving to overcome budgetary constraints. Some considered resourcefulness to be preferable to creativity which was seen as undesirable and wasteful. This concept bore striking similarity with the implicit message of the impact agenda that creativity is a liability.

In addition to these concepts of creativity, two broad categories of ideas emerged about the role of creativity in science itself.

- The *good science* view, comprising: the centrality of creativity to scientific endeavour; creativity as the means by which science advances and creativity as making a researcher more employable. This view functions as a conceptual facilitator of creativity since it prizes creativity highly.
- The *bad science* view, comprising creativity as incompatible with science (which is controlled and is rational). For some, creativity was considered alarming, time-wasting and there was peer pressure to hide creativity or present it in a more palatable way. This view acts as a conceptual barrier to creativity since its adherents do not seek to be creative in their work.

Implications

This study revealed the existence of a broad range of concepts of creativity. Some of these were surprisingly restricted and negative, including notions of creativity as unscientific and wasteful. Although the extent of influence of current creativity discourses on these researchers' views was not established in this study, strong similarities emerged between the impact message and researchers' concepts of creativity, particularly around creativity as resourcefulness and the *bad science* view. There were clear suggestions that the impact agenda is having a constricting influence on the both the creative aspirations and outputs of some researchers. Whatever their origin, these negative concepts of creativity and its role in science are of concern to all with an interest in the career development of researchers and the role of universities in the knowledge economy. To facilitate more truly creative research, 'creativity' needs to be reclaimed.

(988 words)

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