Dissertation Summary – **Dav Clark** – UC Dissertation Year Fellowship 2012

How can educators address those who are already committed to an incorrect belief? In the case of climate change denial, the question is hardly idle. Numerous scientific bodies have concluded that global climate change will likely contribute to widespread extinctions and decrements in human well-being. In the U.S., despite mounting evidence, the proportion of individuals who accept the reality of human-caused climate change appears to be on the decline from a figure that is already below 50%. The problem is situated within the general field of science and mathematics education, with elements drawn from the literatures on belief and attitude revision, conceptual change, and behavioral change. In my dissertation research, I explore the application of proven interventions: "Numerically Driven Inferencing" and mechanistic explanations, both of which are described in greater detail below. In particular, I employ a cognitive orientation to identify critical aspects of participants' reasoning and emotional responses to our materials.

Numerically Driven Inferencing (NDI) is a program of research with almost a decade of history in the Reasoning group, directed by Michael Ranney. In my own research, I have demonstrated that durable shifts in individual's numerical estimation appear to be driven by at least two forms of processing: (1) a consciously accessible trace of the learning experience and (2) a more implicit process which is driven by surprise and perhaps other emotional factors. These estimates provide a kind of educational stimulus that can be connected to a complex conceptual and emotional network in an individual's memory. At the same time, numbers may be presented or collected in a brief moment, allowing for a careful characterization of psychological responses. In the domain of climate change education, we have demonstrated that sets of numerical facts can shift individuals' attitudes and self-assessment of their knowledge immediately following instruction.

While there is less experience in the Reasoning group regarding the pedagogical utility of explanation, there is broad evidence that causal reasoning provides a powerful boost to one's learning and general cognition. Members of the group have developed a compact 400-word description of the mechanism via which greenhouse gases increase global mean temperature. As with our NDI intervention, our initial results are quite clear: our description yields marked changes in attitudes and self-assessment of one's own knowledge.

For both of the above-mentioned approaches, I am currently deploying on-line surveys for longitudinal follow-ups with the general American public. This will allow me to ascertain if the psychological factors mentioned above (i.e., conscious recollection and an emotionally driven response) contribute to long-term learning and attitude change.

Together, the above approaches will provide a useful contribution to our understanding of the psychological processes at play in policy-relevant learning scenarios. As a psychological researcher, I will identify and provide methods for measuring cognitive factors relevant to evaluating a potentially broad range of educational initiatives. For example, these factors may find application in evolution education. A more immediately practical result for educators will be the specific materials for climate education that we will continue to evaluate and refine.