Response to: Are We Educating or Training?

Respuesta a: ¿estamos educando o entrenando?

Réponse à : Éduquer ou entraîner?

James Scott Johnston

Queen's University, Canada

THE FAILURE OF PEDAGOGY in regards to science education speaks to a lack of political will to enact those practices demonstrated by research to be most effective. Such practices are costly: limited class sizes, semi-structured investigative tasks, small-group learning, projects rather than rote, and above all, time to proceed from problem finding-to inquiry-to resolution all take resources and funds that most universities (not to say high schools) seem unwilling to put forth. Sadly, this state of affairs is unlikely to improve, given increasing calls for accountability and fiscal responsibility on the part of the universities in North America. The likelihood of having to do more with less is great.

And yet.

If we are truly concerned about remedying pedagogy, then we must be prepared to teach beyond the confines of current practices. Ana Jofre hopes that, with a sufficient scientific base grounded in rote, students will be led to authentic scientific inquiry, involving discovery. Discovery is the aim of scientific inquiry. And scientific inquiry is that set of methods, techniques, attitudes and tempers that, when honed by observation and practice, yields anticipated results. It shares many of the traits and characteristics of deliberately conducted art and for this reason may be called an investigative art. As Jofre says, when we encourage truly scientific inquiry, we are emphasizing not simply the content, but the context in which science takes place.

I am not as sanguine about beginning with rote; but perhaps this is because too little emphasis has been placed on truly scientific inquiry in the high schools. It seems to me that if students had opportunities to problem-solve in the manner of an

investigative art in high school, they would be better prepared for the rote stressed in introductory college science classes. Unfortunately, it seems rote is piled onto rote, and students have to wait until second year or beyond to enter the experimental phase of their scientific studies. This is to be lamented, for it is the experimental, investigative aspect of scientific studies rather than formula or conclusions that matter from the perspective of an inquirer. As with art, conducting the investigation to a settled outcome is the satisfactory thing, not the storing up of others' conclusions.

Though I don't anticipate any changes to the high school curriculum, it nevertheless bears repeating that student experimentation in a facilitated environment is far more conducive to mastering the art of scientific inquiry than is memorizing formula or conclusions. The memorization of formula or conclusions is but a means to an end—a necessary means perhaps, given our current situation, but a means nonetheless. If, as Jofre suggests, we want scientific inquirers above all, then scientific inquiry as a deliberative, investigative process beginning with problem-finding and concluding in a settled outcome, should be our aim. We must develop the political will to carry this through.