Chapter 5.9
Herding Cats:
Striking a Balance Between Autonomy and Control in Online Classes

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EXECUTIVE SUMMARY

Teachers using online learning environments have found that traditional classroom control techniques do not work when applied online. Instead, other approaches need to be used. This chapter introduces the concept of *knowledge-building* as an approach that is effective in online learning, and the concept of *protocological control* as a means of controlling the communications networks that evolve during the learning process. Data from a study involving students in a gr. 5/6 hybrid (online and face-to-face) class are used to illustrate how the teacher controls the learning process when the students all work independently of each other. The use of *social network analysis* as a tool for visualizing the communications networks that form is demonstrated.

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INTRODUCTION

Online learning is growing by leaps and bounds throughout North America. Christensen, Horn, and Johnson note that student enrolment in online classes has risen from forty-five thousand in 2000 to about one million by 2008 (2008, p. 98). Further, their extrapolations indicate that by 2019, fully fifty percent of U.S. secondary school classes will be online. Even if these predictions fall short, online education is positioning itself to be a potent factor in North American education.

One of the more popular and successful ways to conduct online learning is via the *blended* or *hybrid* class model (Palloff & Pratt, 2001). Such classes feature both live-class interactions in a traditional classroom, and online interactions through some form of online learning environment. However

appearances are deceiving: such classes cannot be run in the manner of a traditional class, even though they may take place, at least partially, in a traditional classroom setting. Due to the asynchronous nature of online learning environments, traditional means of control of the learning process quickly reveal themselves as unworkable, and the teacher has to adjust to news ways of working. As Palloff and Pratt note, "Teaching in the cyberspace classroom requires that we move beyond traditional models of pedagogy into new practices that are more facilitative." (2001, p. 20)

This chapter explores how one teacher in a Gr. 5/6 hybrid class manages the learning process in a through a combination of knowledge-building pedagogy (Scardamalia & Bereiter, 2003b) and *protocological* control, a way of controlling networks (Galloway & Thacker, 2007).

NASA's Problem

Space exploration in general, and Mars exploration in particular provide good examples of challenging control problems. Some years ago, when NASA was designing the now-famous Mars Rovers, it was presented with such a problem: Mars is a long way from Earth, and to communicate with the rovers, scientists needed to use radio. Radio waves are part of the electromagnetic spectrum (like light), and suffer from the same limitations– radio waves travel at a finite speed. Mars is so distant that there is a ten minute lag between the time a signal is sent from the Earth to when it is received on Mars; twenty minutes for the round trip (Intelligent Systems Division, 2008). Now imagine the problem: the rover is on Mars and a landslide starts downhill toward it. If traditional hierarchical control is applied, then the rover's video signals would have to be monitored twenty-four hours each day, seven days a week, looking for problems. When the video of the landslide is transmitted, it would take ten minutes to reach the control technician. Assuming the technician is alert, and not on a break, the message telling the rover to move out of the way would arrive at Mars ten minutes later, completing the twenty minute round trip. Landslides move more quickly than that, even in low gravity. The rover would be destroyed. Traditional control won't work, and another solution had to be found.

Figure 1. A Mars rover (NASA, 2008)

The solution was to *not* control the rovers directly. Instead, the rovers were built with *bug-level* intelligence. Insects routinely engage in goal-seeking behaviors (as when bees forage for flowers), avoid dangers, and so forth. Giving the rovers artificial intelligence of this level gave them sufficient autonomy to control themselves. NASA could specify the goal: move to a rock or other Martian feature, but the rovers *decided for themselves* how to move to that goal. The overarching goal was specified, but the specific path to that goal was not.

Most robots in current use (such as the military's mine clearing robots) are sort of like puppets. An operator directly controls every movement. This is called *short-leash* control (Stanovich, 2004). There is no intelligence in the machine, only in the operator.

The rovers operate by what is called *long-leash* control (Stanovich, 2004). They make some autonomous decisions, but scientists provide the overall direction. Named *Spirit* and *Opportunity*, they are among the most successful and famous of NASA's current missions, and are, to a degree, autonomous machines. At the time of writing,