Chapter 14
Animalia:
Collaborative Science Problem Solving Learning and Assessment

Sara Bakken
Pearson Education, USA

Cheryl K. Johnson
Pearson Education, USA

John Bielinski
Pearson Education, USA

Yigal Rosen
Harvard University, USA

ABSTRACT

The study described in this chapter is based on a joint World ORT, Israeli Ministry of Education and Pearson initiative to provide an opportunity for international student collaboration on a series of complex science problems. Students from four schools in Israel, three in the United States and one in Mexico, participated in collaborative complex problem-solving on science topics selected by teachers at the participating schools. The intent was to expose students to the realities of collaborating with people under unfamiliar conditions (such as different cultures, languages, and time zones) in order to reach a shared goal, and to foster the value of this practice. The chapter presents the rationale for the project, describes the Animalia mini-course in detail, presents major findings and discusses implications for future curriculum development and further research.

INTRODUCTION

Global Educational Movement towards 21st Century Skills

There seems to be wide agreement that the global workplace of the future will require skills beyond those taught in most schools today. Several organizations, such as the Partnership for 21st Century Skills (P21), have helped define the kinds of skills that worldwide businesses, higher education institutions, government entities, policymakers, and education administrations believe all students need to succeed, skills such as: flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership, and responsibility (P21, 2014). To help foster development in these areas, a general framework for effective 21st century learning environments was proposed by the As-

DOI: 10.4018/978-1-4666-9441-5.ch014

sessment and Teaching of 21st Century Skills (ATC21s), an organization formed and funded by three of the technology industry's leaders (Microsoft, Cisco, and Intel) in collaboration with government groups, educational institutions, and the Organization for Economic Co-operation and Development (OECD). Specifically, to foster 21st century skills in the classroom, learning environments should emphasize:

- Making learning central, encouraging engagement, and being the place where students come to understand themselves as learners;
- Ensuring that learning is social and often collaborative;
- Being highly attuned to students' motivation and the importance of emotions;
- Being accurately sensitive to individual differences, including prior knowledge;
- Placing demands on every student, without overloading students;
- Using assessments that emphasize formative feedback; and
- Promoting connections across activities and subjects, both in and out of school (Preparing Teachers and Developing School Leaders for the 21st Century, Schleicher, 2012).

These skills and learning environments are intended to prepare students not only for college, but for the reality of our evolving global workplace. One area of particular importance is collaboration.

Collaborative learning is that which requires students to engage with others as a team, share knowledge, organize the group's work, and monitor its progress while demonstrating effective and respectful communication (including peer feedback on work) among all members (Rosen, & Foltz, 2014; Rosen, & Tager, 2013). Collaborative learning and problem solving is growing in popularity as a way to introduce students to the importance of developing strong communication skills and then to provide the opportunities needed to develop them, and rightfully so given that it is intended, in part, to model the work of global teams. It is no longer sufficient to be an outstanding scholar in a singular sense; success in the future workplace is likely to require excellence in working with others in a variety of dynamic situations. "Students need to be capable of not only adapting but also of constantly learning and growing, of positioning themselves and repositioning themselves in a fast changing world" (OECD, Schleicher, 2012).

The worldwide enthusiasm for this new educational paradigm means that teachers and school administrators who value these skills must find effective yet reasonable ways to integrate new concepts and tasks into their classrooms. Very few current curricula introduce or emphasize 21st century skills such as collaboration. Pedagogies and learning materials must be rethought and redesigned, and at a point when many conflicting priorities already compete for classroom time. Is it possible to adapt the existing curricula without sacrificing other kinds of learning? How will educators create learning tasks that provide authentic opportunities for students to learn and develop these talents? How will teachers observe growth in these collaboration skills? Finding creative and effective, yet practical, ways to integrate 21st century skills into students' lives is essential.

Some resources are already available. The P21, for example, with the support of the U.S. Department of Education, provides professional development information and teacher tool kits. The P21 also suggests that the Common Core State Standards "College Readiness" skills (which are expected to heavily influence the development of new curricula) are closely aligned with the complex thinking skills outlined in their own framework.

To broaden the offering of evidence-based educational resources, researchers have begun both large-scale efforts and more narrowly-focused