Chapter 8
Dissection of a Desktop Microworld

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EXECUTIVE SUMMARY

Despite the long history of the use of dissection in biology coursework, it has and continues to be, very controversial (Hart et al, 2008; Kinzie et al, 1993; Langley, 1991; Orlans, 1988; Nobis, 2002; Strauss, 1991; Madrazo, G, 2002). This case study evaluation was conducted in an affluent suburban middle school in the Upper Midwest as a response to the problem of finding an alternative means of instruction that would yield the same cognitive knowledge development, address the issue of science anxiety, and accommodate different learning modalities. Several alternatives were compared in 14 seventh-grade biology classrooms, including physical dissection, virtual dissection in a desktop microworld, and content instruction through an interactive CD-ROM tutorial. Although differences were observed in immediate retention, none were observed in retention after three months. Differences in science anxiety are discussed, and comparisons made of retention and anxiety among various learning styles. Implications for classroom instruction are discussed from an instructional perspective. The smell of formaldehyde was in the air as students tenaciously poked with dissection probes at the frogs pinned to their dissection trays. The familiar comments of “Gross!” “I don’t want to cut him,” and “Hey, Mrs. M, what do I do now?” punctuated the air. It was the start of the annual climax of the seventh-grade biology curriculum, dissecting a frog. The teacher, already dealing with notes from parents objecting to their sons/daughters participating and the logistics of helping 30 students simultaneously, could not help but think that there had to be an alternative way of presenting the experience to the students. This case study was born from that familiar, frustrating scene, which occurs annually throughout school systems everywhere. The teacher in the scenario above was one of three from the Biology department at a middle school in northeastern Illinois. Her team came to Christine with the problem of finding an alternative means of instructional delivery that would yield substantially the same cognitive knowledge development in the students, help address the declining frog population, address the issue of science anxiety among students at the middle school level, and accommodate the learning modalities of the students.

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BACKGROUND

In 1946, four one-room school districts merged to form a single elementary school district covering approximately 20 square miles in northeastern Illinois. Since that time, the area has changed from mainly rural farmland with a few small towns to six well-populated, growing suburbs. The suburbs themselves are among the most affluent in terms of per capita annual income in the US. The student body has changed little since the time of the study as shown by the following indicators of its makeup. It is still predominantly White (1996: 88%; 2007: 81.2%), but the Asian/Pacific Islander population has increased from 1.7% in 1996 to 7.6% in 2007. Still, only a small percentage of students are Black (1996: 1.7%; 2007: 1.4%), Hispanic (1996: 2.4%; 2007: 3.7%), low-income (1996: 2.1%; 2007: 3.8%), and/or categorized as having limited English proficiency (1996: 2.3%; 2007: 3.6%). Most district students continue their education at a nearby public high school consistently identified as one of the top 100 in the country over the past decade.

Perhaps influenced by the prestige of the high school, the district’s stated vision is to become the premier elementary school district in the nation, and it appears to be well on its way. Teachers have an average of 13.8 years of experience, and 60.6% hold graduate degrees. The student:teacher ratio is 17.8:1. District performance on the Illinois Standards Achievement Test is strong. For example, 97.7% of district third-graders and 98.5% of district fifth-graders meet or exceed Illinois learning standards in mathematics, and 96.4% of district fourth-graders and 93.8% of district seventh-graders meet or exceed state standards in science. Five district schools— including the middle school that is the focus of this chapter—were named in March 2007 to the Chicago Sun Times Top 50 Suburban Public Schools list. In recognition for academic excellence, the middle school at the heart of this case study was named a Blue Ribbon School by the US Department of Education in October 2007.

The surrounding communities greatly support the district’s educational efforts. In the past 14 years, three building referenda and an educational fund referendum have been passed. The district’s own Foundation for Educational Excellence, and each school’s Parent/Teacher Organization (PTO), help fund innovative teacher development activities and the purchase of computer and other educational and recreational items to enhance student learning. In 1999, the district constructed a new elementary school and a new middle school, and made major renovations to three existing school buildings. That same year, it reorganized into one building designated as an early childhood/Kindergarten center, four buildings as elementary schools housing Grades 1-5, and two buildings as middle schools housing Grades 6-8.

SETTING THE STAGE

At the middle school that is the subject of our case study (let’s call it Smith School), the curriculum is designed and managed by teams of teachers from each core subject area (i.e.: math, science, English language arts) for each grade level. There are also three additional teams, one of which is Special Services, that design and manage the curriculum outside of the core subjects (i.e.: music, art, physical education). The members of the Special Services team included school counselors, social workers, speech therapists, and the Learning Center/Technology Director (LCTD) of the school.

Christine was employed as the LCTD from 1994 to 2008, and reported directly to the school principal. The district has a Technology Coordinator, but the areas of responsibility merely overlapped in some areas rather than having a hierarchical relationship. In other words, the LCTD did not report to the district Technology Coordinator, but had to seek cooperation/