Computer and hands-on simulations of Mendelian genetics

Charlotte K. Omoto

Department of Genetics and Cell Biology,
Washington State University, P.O. Box 644234, Pullman, WA 99164-4234
(509) 335-5591; FAX (509) 335-1907; omoto@wsu.edu

For organisms with relatively few offspring, it is difficult to deduce the underlying rules of Mendelian inheritance, since the result of a cross does not necessarily result in the predicted ratios of phenotypes. A computer simulation (Parakeet Tango©), and a simple coin-toss game are useful for illustrating the fundamentals of Mendelian genetics for organisms with relatively few offspring.

Parakeet Tango, a 10.2 Mbytes Macintosh program written in MacroMind Director 4.0 by Chiranjiv Singh under the direction of Charlotte Omoto and Gary Brown., is designed to teach deductive reasoning along with Mendelian genetics. At each of the eight levels, there is a choice of two breeding groups. A useful feature of this program is that the results of a cross are randomized with respect to the number of offspring, sex ratio, and genotype within the constraints of Mendelian genetics. A copy of the Parakeet Tango program may be downloaded free from http://www.salc.wsu.edu/SysAdmin/icelab.html#projects. The manual and sample results sheet may be downloaded from the author's homepage at:
http://www.wsu.edu/~omoto/biblio.html#pedagogical

The hands-on exercise uses a simple coin-toss game (Omoto, 1998). The materials for the hands-on exercise are sets of pedigree charts. Each group of students receives a "genotype" pedigree chart and several corresponding blank "phenotype" pedigree charts. The genotype chart indicates the genotype of select individuals and whether the trait to be simulated is dominant, recessive, or sex-linked recessive. The phenotype pedigree charts correspond to the genotype chart but are left blank. The exercise involves filling in the genotype chart by tossing a coin to determine which of the two alleles from each parent is inherited by an offspring. Thus the exercise simulates nature; each offspring is a result of random choice of one of the two copies of the gene in each parent. The genotype chart is used as a guide to fill in the phenotype chart. The students then discuss whether one can unambiguously decide whether the trait was a dominant, recessive, or sex-linked recessive trait, for their own pedigree and the phenotype pedigree chart produced by other groups.

References

Omoto, C.K. 1998. Learning Mendelian Genetics through a simple coin toss game. American Biology Teacher (in press). [Available at http://www.wsu.edu/~omoto/papers/cointoss.html.]

Reprinted From: Omoto, C. K. 1998. Computer and hands-on simulations of Mendelian genetics. Page 340, *in* Tested studies for laboratory teaching, Volume 19 (S. J. Karcher, Editor). Proceedings of the 19th Workshop/Conference of the Association for Biology Laboratory Education (ABLE), 365 pages.