Humane Science Projects

The following suggestions for biology studies are scientifically educational and ethically non-controversial.

Each of the studies below, of which limitless variations can be conceived, can be tailored to suit the full range of student age groups, and designed to involve most or all of the key elements of the scientific process: study design, data collection and analysis, experimental manipulation, etc. They are ideal for science fair assignments.*

Companion Animal Studies

- Conduct a behavioral study of your companion animal(s) at home. For example, to what sounds do they respond? Tape record different voices (familiar versus unfamiliar) and monitor the animal's response when played back. Compare response to different vocal inflections. Closely observe a sleeping pet and monitor body movements, frequency of REM sleep. Prepare an ethogram that reflects the different personality of different individual cats or dogs. If you live with two or more cats or dogs, give them ethogram to another family member to see if they identify the individual being described.
- Examine play behavior, eating behavior, etc. (a video camera may be very useful for such studies).

Bird Studies

- For urban students in cold winter days: have students observe the numbers of starlings they see on a fixed number of chimneys while they are on their way to school. Have the students combine their data into one class table containing the following: date, time, weather (temperature and wind speed), the number of starlings perched on the chimney, and the number of chimneys observed (Stamm, et al. 1993).
- Observe nesting birds. Watch a nest for an hour each day. Estimate the number of insects consumed, based on number of trips to/from the nest. Extrapolate over all the daylight hours. Do males or females perform equal amounts of parental duties?
- Using a tape recorder, make an inventory of different vocalizations of a common species of bird (e.g., starlings, crows). Try to relate different calls to different situations and speculate on their function. Compare with published findings. Many mockingbirds mimic the calls of other birds. Try to identify them. Why might they do this?
- Observe birds at feeders. Sample questions: Which species eat together? Which species leave when other species arrive? Which species eat which seeds/fruits/berries and why? How long do different species stay on the feeder? Which bird species are attracted to which types of birdhouses and/or cover vegetation and why?

Tree Studies

- Examine the trunks of dead and living trees in a wooded area and compare them for woodpecker holes and fungal growth. Speculate on the ecological role of dead trees.

- Study leafing patterns of trees or bushes. Which species do/don't drop their leaves for the winter? Which drop their leaves the soonest? Which leaves do/don't change color? Why? Is there any pattern to the way leaves turn and fall?
- Analyze habitats in a local piece of wild land. What types of trees are there? What types of animals are there? Compare species richness, and successional stages.

Plant Studies

- In late summer or autumn, walk one's dog through the woods, then study the seeds that are dispersed by clinging to the dog's fur. If a dog is not available, an old blanket may be used instead. Compare the fauna of organic farms with farms where pesticides are used. Relate to current trends towards organic farming.
- Conduct comparative studies of plants. For example, examine two populations of dandelions, one growing in an undisturbed area, the other in a more disturbed area. How do stem length, seed number, plant density, leaf area, seed plume length and width, etc., compare? Advanced classes could relate the data to r and K selection.
- Count seeds on plants. How many seeds do different plants produce? How does number of seeds vary among seedpods on a single plant? On different plants of a single species? On different species? Why?
- Sample plants from small plots in the school ground (or backyard). Relate their distribution to microhabitats, student activity patterns, etc.
- Prepare an arboretum of plants growing on the school property. Grow bean sprouts in commercial sprouters (beans and sprouters are available in natural food stores). Compare growth rates of different types of beans, different lighting conditions. Compare different sprouter designs. Compare taste preferences of students.
- Study and compare the growth of individual plants under different growing conditions (light, water, fertilizer, pruning, etc.).

Invertebrate Studies

- "Bee Visit" is a computer-based interactive pollen transfer modeling program for investigating the relative contributions of different pollinator species to a plant's reproductive success. Have students study variables such as expected visits by different types of "bees," the presentation of pollen through time, the amount of available pollen removed by each visitor, the amount of pollen successfully exported to stigmas, and the survival rate of pollen grains (Stanley, 1999).
- Maintain a compost pile and study the invertebrates that live in it.
- Put up a bright light to attract insects to a white sheet. Identify them while they are on the sheet. Compare diversity on different nights and in different locales.
- Sample the soil in different habitats and, with the aid of a microscope, survey the invertebrates (insects, earthworms, roundworms, etc.) found there. How do different habitats compare? Different soil depths? Different seasons?
- Conduct an invertebrate catch/release (outside) operation in your home. List all the invertebrates (spiders, flies, ants, millipedes, cockroaches, moths, fleas, etc.) you find over a one-month period. Describe their living preferences. Survey your home for ways invertebrates might enter (including on you!).

- Investigate food preferences of ants. Design a study involving placing different food items near the entrance to one or more ant colonies and recording behavioral responses of ants. Similar studies can be done with bees using sugar-water stations. Do the bees learn the location of a new but dependable food source?
- Set up a translucent soil medium or a container and have students watch one half dozen earthworms in their habitat. Ask the following questions: Do they appear to tunnel in random patterns? How do they respond if they come into contact with another worm? Is their activity in synchrony with any outside cycles (daylight, lunar, weather, and tides)?
- Survey a particular plant species for insect life. What sorts of adaptations (e.g., Camouflagic, or aposematic coloration) do certain species have for living on this plant? Monitor the number of insect visitors to a small cluster of flowers/plants. How does visitation change with time of day, year, weather, etc.?

Behavioral/Physiological Studies

- Develop an ethogram—a complete behavioral repertoire of a species.
- Do physiological self-study. For example, test hearing directionality with blindfolded students. Test smell/taste acuity of students (e.g., using juice from various fruits). Other phenomena to investigate: touch acuity, growth rates (hair, nails), muscle fatigue, heart rate, reaction time (e.g., under different eating regimens), memory, learning rate, vocal recognition.
- Measure the heights of students in the class. Compute the mean and standard deviation. Are there significant differences based on age, sex, and family history? Compare statistics for small and large groups of students.
- Compare the behavior of ducks at a pond where they are fed by humans and at a pond where they are not, and/or where hunting is permitted.
- Study absenteeism in school. Relate your findings to season, contagious versus non-contagious illnesses, etc.

Miscellaneous Studies

- Frogwatch USA allows students to count the number of frogs in their backyard and report it to a main database, which is maintaining a running tab on the input and will estimate the total number of frogs still in the wild.
- Compare species diversity (of birds, insects, plants) in different habitats by walking transects.
- Simulate the mark-recapture method for estimating population size by counting the number of taxicabs, buses, or pickup trucks at the intersection of a street. Repeat the counts at a later date for "recaptures." (Feldhamer, 1996).
- Examine air pollution by sampling (say, by rubbing them with white tissue paper) the surfaces of tree leaves or building surfaces in different areas of a city. If you live near an industrial incinerator, you might compare samples taken at different distances (100 yards, 1/2 mile, 5 miles, etc.) from the incinerator.
- Use a water analysis kit to test water quality at various points along a river or stream. Relate bacteria, heavy metals, turbidity, etc., with industry, water treatment plants, erosion, weather conditions (e.g., rain), etc.

- Visit a local pond where bats forage at dusk. Time the arrival of the bats on different nights and compare with time of year (official sunset data can be obtained from a local weather station). Estimate insect abundance by counting sudden changes of flight direction in bats (attacks).
- Survey road kills. Relate to different locales (rural/urban), road types (paved/ unpaved; two-lane/four-lane). Discuss possible ways to reduce road-kills. (For health and safety reasons, animal carcasses should not be handled directly.)
- Study the growth of molds on food items under different growing conditions. Vary foods and growing conditions.
- Collect, grow and study bacterial cultures from various places. For example: garbage cans, doorknobs, mouth. Compare bacteria in mouth before and after brushing. Compare different growing conditions: temperature, humidity, etc.

Useful References

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