Making a Comeback: Succession in Tiger Square

A long-term *School Yard Investigation Plan* designed by Sam Long for the students of Union County High School, Lake Butler, Florida

developed as a follow-up for the Oxford Institute for Environmental Education Workshop, November 2009

Goals and Objectives – At the conclusion of this investigation, the student should be able to:

- ✓ determine the agents of succession through the observation of the natural recovery of plant and animal life the Tiger Square courtyard
- ✓ develop observation and questioning skills
- ✓ practice a scientific "method" of experimentation as a process to learn about the world
- ✓ communicate results of an experiment to expand the body of knowledge that is Science
- ✓ develop a land-use plan for the future of Tiger Square
- ✓ establish a foundation for extensions leading to a science fair projects

Correlations –

Florida Sunshine State Standards for Science

- ✓ **SC.912.L.17.1** – Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.

- ✓ **SC.912.L.17.4** – Describe changes in ecosystems resulting from seasonal variations, climate change and succession.

- ✓ **SC.912.L.17.5** – Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.

- ✓ **SC.912.L.17.7** – Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.

- ✓ **SC.912.L.17.8** – Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

- ✓ **SC.912.N.1.1** – Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

    1. pose questions about the natural world,
    2. conduct systematic observations,
    3. examine books and other sources of information to see what is already known,
    4. review what is known in light of empirical evidence,
    5. plan investigations,
    6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),
    7. pose answers, explanations, or descriptions of events,
    8. generate explanations that explicate or describe natural phenomena (inferences),
    9. use appropriate evidence and reasoning to justify these explanations to others,
    10. communicate results of scientific investigations, and
    11. evaluate the merits of the explanations produced by others.

- ✓ **SC.912.N.1.2** – Describe and explain what characterizes science and its methods.

- ✓ **SC.912.N.1.3** – Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

- ✓ **SC.912.N.1.6** – Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

- ✓ **SC.912.N.1.7** – Recognize the role of creativity in constructing scientific questions, methods and explanations.

National Science Education Content Standards, Grades 9 – 12

- ✓ **A.1** – abilities necessary to do scientific inquiry

- ✓ **A.2** – understandings about scientific inquiry

- ✓ **C.4** – the interdependence of organisms
- ✓ **F.4** – environmental quality
- ✓ **G.2** – nature of scientific knowledge

The Investigation

Background – in the spring of 2009, two large oak trees were removed from Tiger Square, a popular courtyard area on the UCHS campus. Naturally there was some initial outrage at the visible devastation in the area. However, a unique opportunity to study natural succession presented itself, and life surveys are being taken at regular intervals throughout the year.

Engaging students – a slide show presentation of the area immediately following the destruction of the area, then a "field trip" to Tiger Square. Students make observations, and record in their journals, that lead to student questions. [NOTE: precede with or include guidance on observations and "good" questions (?)] Things to consider may include: Is there anything living in the area? Can a devastated area support life, and if so, what kind? Can the area recover naturally, and what kinds of agents would be involved?

Observations – student generated. *Examples may include*: Tiger Square was completely destroyed and nothing live in it; human intervention will be necessary if we want the courtyard to once again be a naturally vital area

Questions – student generated. *Examples may include*: What kinds of organisms are able to live in the devastated area? What kind of organisms might we expect to find? Why are certain types of organisms absent? What can we expect to find during the natural recovery of the area? How can we determine if the recovery is successful?

Hypothesis – student generated. *Should be similar, and can be guided toward if necessary, to:* The natural recovery of the area can be deemed successful if there is a vital ecosystem present after one year has passed.

Methodology for Designing and Implementing the Investigation

Experimental design – student generated, but should include: getting samples of plant and animal life from Tiger Square; surveying plant and animal life in Tiger Square at regular intervals throughout one year's time.

Materials – would include student journals, Berlese funnels, trays, and sample containers, pipettes, forceps, probes, petri dishes, stereomicroscopes, isopropyl alcohol, identification guides, etc.

Sampling sites – various locations in and around Tiger Square

Predictions – student generated. *Should be linked to or restate the hypothesis, such as*: if the area is indeed recovering, then there should see an increase in the diversity of life both in numbers of species and numbers of organisms in successive surveys.

Procedure – brainstorm to generate questions, hypotheses, procedures; work as a class, or small groups; maybe divide various aspects of the investigation (i.e. plant life, insects, other organisms, food webs, ecosystems, etc.) among groups and then they would have to co-ordinate/communicate their results with each other (remember how we did it @Oxford!)

Day One – "field trip" to the Tiger Square to make observations and questions. Return to the classroom to compare and discuss
Day Two – decide on a question and a hypothesis, develop a plan of action for testing / sampling
Day Three – return to the Tiger Square to collect samples; cleanup and storage of equipment and specimens
Day Four – analyze the samples, count and identify numbers of organisms and types of species; begin discussion of "what does it mean?" – indicate numbers of tolerant or intolerant species present [this may need to be preceded by a discussion on identifying species]
Day Five – analyze/discuss data; compare to hypothesis; derive a conclusion

At approximately one to two month intervals, repeat the procedure. Make sure to log the results. Compare current and past surveys.

Analysis & **Communication** – write up experiment, results, and analysis in a "professional" format

Resources –

Prentice-Hall Biology (Florida edition), Kenneth Miller & Joseph Levine, Pearson Education, Boston MA, 2006

Peterson First Guide to Insects of North America, Leahy, Peterson, & White, Houghton Mifflin Harcourt, 1998

Grasses: An Identification Guide, Lauren Brown, Houghton Mifflin Harcourt, 1992

Wildflowers of North America: A Guide to Field Identification, Venning & Saito, St Martin's Press, 2001

Budget – most equipment is already available at my school, however:

- ✓ Stereomicroscope@$215.00 through Carolina Science Catalog (WF-59-1823)
- ✓ Donated materials for Berlese funnels: 2-liter plastic bottles, mesh, duct tape, baggies

Cross-curricular Opportunities

- ✓ Publish data and results in a "professional" format paper (coordinate with English dept). [NOTE: precede with examples of other professional writing, preferably written by students if possible]. Have students conduct peer review of each other's work.

- ✓ Write an article and submit it for publication in the school newsletter and local newspaper

Extensions

- ✓ to perform the same analysis in similarly devastated areas such as construction sites and logged out areas

- ✓ if this is done at the beginning of the school year, then students would have a basis for science fair projects!

- ✓ to design and implement a "green" land-use plan for the Tiger Square area, such as an outdoor classroom, or biome exhibits

- ✓ students may be able to incorporate their experimentation into their future biology courses

- ✓ get papers publish in student scientific journals, or even create and publish our own. Present them for peer review

- ✓ have students research similar investigations and compare results, possibly co-ordinate and collaborate with other schools in the area, or from the schools of my esteemed colleagues from OIEE!