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Description of Tree Research Course: Fall 2003, City-As-School
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Who:
Twelve City-As-School (CAS) high school students participated in an eight-week environmental research class that focused on our urban forest. This class was structured to facilitate the gathering of street tree data for The Council on the Environment's street tree mapping project.

When:
Each week students met for 3 hours to collect data and discuss relevant topics concerning urban trees, such as urban ecosystems, tree physiology, invasive species, carbon cycling, etc. The class began in September and continued through November.

Where:
We mapped all of the trees on Barrow St. and St. Luke's Place between Varick and Hudson Streets in the West Village. There were approximately 50 trees in total.

What:
For each tree we measured or determined the following:

- Location
- Height
- Diameter at Breast Height
- Age
- Species
- Canopy size
- Condition
- Foliage Density
- Ground to Crown Height
- Pit size
- Pit condition
- Presence of tree guards or grates
- General Comments: including the presence of garbage, lack of sunlight for part of the tree, need for specific pruning, etc.

How:
Students used a variety of tools and techniques to make the preceding determinations. They used measuring tapes, diameter tapes, species keys, foliage density keys, diameter-age calculations, etc. They entered the data into a palm pilot, equipped with Arc Explorer that would then be uploaded to a "master" computer that held all of the collected data.

This research class enabled students to conduct "real" research that could be used by community activists, researchers and city planners to make decisions and understand the health and equality of the urban forest. This opportunity was

perfect for high school students to practice research techniques while making an important contribution to their community. Direct contact with trees during the class, enabled students to make observations about specific tree species, tree growth, interactions between species within an ecosystem: such as pests/diseases, animals, etc and their reliance on trees.

Their understanding of trees and ecosystem dynamics was supplemented by weekly reading assignments. These included: Tree Physiology, Ecological Benefits of Trees in an Urban Landscape, Trees in the Carbon and Water cycles, Threats to Urban Trees: The Asian Long-horned Beetle and Pollution and the Street Tree (some are located at our website: http://projectgrow.org/treesassignments.html). We would discuss homework assignment questions using our research experience to further our understanding and clarify confusions about the texts.

Outcomes:
We did manage to measure every street tree on two local city streets but our data was inaccurate. Though high school students are more than capable of making detailed measurements, City-As-School students were often impatient and careless. Each student worked in a team of 3-4 students. At times, teamwork between students was not optimal. Students had difficulty communicating results and agreeing on measurements. Frustrated, the student who entered the data often just put in what his/her peer told him/her to avoid confrontations. Our situation was not ideal because CAS students come from all over the city to our school, therefore, the local CAS neighborhood was not "their" neighborhood, and I think students were not as compelled to map someone else's trees. Some of the measurement techniques were not appropriate for our needs. For example, taking tree height measurements entails having the students walk 66 feet away from the tree. At times this was impossible due to parked cars and traffic. We modified the procedure by measuring five feet from the ground. We would then walk away from the tree until our fist measured the five feet. At that distance we would use our fist height to calculate the height of the tree. Lastly, eight weeks was a long period to continue measuring trees since many students found the procedures tedious. On the other hand, eight weeks was too short to really analyze our results. At the end of the eight weeks, each student in the class created a PowerPoint presentation about their findings, but with so little time to analyze, students had a hard time making concrete conclusions.

Recommendations:
I think this class would be ideal for Junior High School students who can map their own school/neighborhood trees. Junior High School students would find data collecting novel and engaging, while my high school students were often more interested in buying slices and smoking cigarettes. A longer timeframe might also be better. Taking measurements over a year might provide consistency without having to concentrate all of the measuring in too short a

timeframe. This would also allow for further discussions about plant biology, ecosystems, community activism/justice, etc. I would also recommend using team leaders. Team leaders could ensure that data was accurate, train teammates and keep the group on task. Ideally, this should be a community project and community members should be aware and involved in the students' research. The teacher in charge should be supported in coordinating public awareness and possible resident/student collaboration efforts. The teacher should be trained in taking measurements accurately and in the use of the palm pilot and ArcExplorer. I learned once, but by the time I was ready to put the information into the computer, I forgot how to operate the palm pilot (for example, I did not know that if the palm pilot's battery runs out, the arc explorer program is lost) and how to upload the information into the main computer. I would suggest that the teacher have a parent or community member assist them in gathering tools and data sheets, overseeing data collection and uploading data.

Conclusion:

Overall, I think this is a very worthwhile endeavor. My school population is very specific. Our students are considered "at risk" which means that it is difficult to ensure continuity and build team spirit. In other schools this project would enable students to become real researchers, while building self-esteem and group teamwork skills. With enough support and training, teachers can create a research project that engages students, facilitates interaction between the school and the community and ultimately can impact the planning and maintenance of our urban forest.