Generalized Fast Plants Schedule

(Based on the lesson plans of the West High Biology I teachers)

Before You Begin the Unit:

® Consult the Fast Plants Growing guide.
® Order seed, Watermat and obtain other materials
® Decide on what type of light system you will construct/buy
® Decide whether any modifications to the growing system (i.e. extra-large reservoirs are needed)
® Prepare the components of the growing system, gather water bottles, make Peters' solution

Day 1 _____ Plant P1, P2, F1 seeds 4-5 per film can pot. See Fast Plants Growing guide.
Introduce the project in terms of the nucleus and that traits are passed from generation to generation.
**Concept Questions:* Do we inherit all traits from both parents? Are there any rules or patterns for the passing of traits from parents to children?

- seeds represent generations - we see the parents and the children at the same time
- explain in simple terns how parents are true breeding
- simple reproductive life cycle of the plant

Day 4 _____ Observe/measure plants. Students draw plants, record height and note stem/leaf color. Each student is responsible for completing and handing in the data sheet. Group will have two students responsible for watering and two students responsible for recording observations.

Day 9 _____ Observe/measure plants. Thin plants to 3 per pot. See Fast Plants Growing guide. Remove parent plants (P1 and P2) from student growing systems. Teachers maintain parent plants separately for observation by students.

Day 14 _____ Observe/measure plants.

Day 16/17 _____ Pollination of F1 with F1. See Fast Plants Growing guide. Observe/measure plants.
**Concept Questions/Additional Experiments:* Observe pollen under microscope

- Flower/bee anatomy
- Pollen has cell surface proteins responsible for recognizing proteins on the surface of the stigma (papilla cells) of the correct species.
- Example of how the egg allows only two sperm cells to enter. This double fertilization creates both the embryo and the endosperm that feeds it.
- Pollen has rough surface allowing it to cling to bee and be released to stigma (papilla cells).

Day 25 _____ Observe/measure plants.

Day 32 _____ Observe/measure plants.
**Concept Questions:* What type of variation is seen among the plants?

Day 39 _____ Allow plants to dry out. Do not refill the nutrient reservoirs.

Day 56 – 93 _____ Collect seed from F2 plants. See Fast Plants Growing guide.
**Concept Questions:* What makes a family? Which of these seeds are "siblings"? If we mated our plants with those in all the classrooms, how would this impact diversity?

Day 94 _____ Plant F2 seeds.

Day 95 _____ Plant 50 F2 seeds on petri plates.

Day 96 _____ Review meiosis and hypothesize mechanisms for heredity.

**Hints for Teaching:* Teachers need to understand and communicate to students that the terms "random" and "independent" assortment are the same. They may encounter both terms as they learn about meiosis and may become confused.

Day 97 _____ Score F2 generation. Any purple seen on the plant is scored as a purple plant.

Fast Plants Calendar Continued

Day 98 _____ Groups form model.

Model must meet three basic requirements:

1) must show chromosomes
2) must show cell division AND gamete formation
3) must work for one and two traits. (mono and dihybrid crosses)

**Hints for Teaching:* Explain that the model is a mental rather than a physical model. Give some examples of physical models and mental models. Tell them what a pure breeding line is and how one is created. Tell students that they are not allowed to use Punnett squares in their presentations. If they follow the three rules established for creating the model, the Punnett square will not be necessary. Forcing them to explain their model without using Punnett squares ensures that they understand what is happening inside of individual cells during meiosis.

Day 102 _____ Groups present initial model on whiteboards.

**Hints for Teaching:* Don't be afraid to let students make mistakes here. An example is representing a pure breeding trait with only one chromosome. If they use one chromosome they will see that after meiosis occurs some gametes will be lacking a chromosome, and therefore the information that codes for that trait. Allow them to propose the concept of dominance and recessiveness and the critical role it plays in explaining traits in the F1 generation. Allow them to uncover the role of independent assortment in getting the proper F2 offspring.

Day 103 _____ Groups test models on computer using simulator.

Computer crosses must include:

P1 X P1
P2 X P2
P1 X P2
P1 X F1
P2 X F1
F1 X F1

**Challenge Cross:* F2 X F1 (ask students if all green leaf, green stem F2 plants are the same "inside". Can we use the results of this cross to "see" the chromosomes inside? State your hypothesis.) Do all F2 plants that look alike (have the same phenotype) share the same genetic makeup (genotype)? How could you find out? See if students can determine that a cross between the F2 individual in question would need to be performed with a double recessive individual and the offspring scored. (This is called a test cross.)

Day 104 _____ Groups test models using computer simulation by completing same crosses for which they made predictions.

Day 105-107 _____ Groups meet and revise model based on findings from computer simulation crosses. One or two days are used to allow students to create a poster-like graphical representation of the model. Posters are required to show chromosomes, cell division, gamete formation, and fertilization for the following crosses: P1 X P2, F1 X F1, F1 X P2.

Day 108 _____ Present final model to class using a poster and some physical display (puppets, play, physical model of chromosomes…) Posters of models are turned in to be graded using scoring rubric.