The Nucleus

Official Quarterly Newsletter of the Texas Association of Biology Teachers

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President's Message:

There is a part of me that celebrates the changes that occurred in Texas science education this school year in Texas; there is another part of me that wakes in the night stressed by all that needs to be accomplished to put those changes - and others looming on the horizon - into effect. I celebrate four years of science (for almost all students) as a requirement for graduation. Schools will be challenged to find certified, qualified, competent teachers; extra facilities and equipment; and how to handle the transition years when schools may see two whole grade levels taking biology at the same time. I am encouraged by the possibility of an End-of-Course assessment system that allows for students to demonstrate proficiency of a subject the year they take a course and for teachers to receive data that can help them to strengthen curriculum and methodologies alike, but there will be incredible challenges for students to meet the requirements of twelve exams. I am thrilled at the prospect of the TEKS being reviewed and revised, yet I worry about how that process will play out. As we seek proactive solutions to the challenges brought about by the 4X4 graduation requirements, HB2236, and the TEKS review/ revision process we need teachers, more so now than ever, to step up and take leadership roles. How?

4X4 Graduation Plans

For clarification and background, the State Board of Education (SBOE) has changed the requirements for graduation under the Recommended High School Program (RHSP) and the Distinguished Achievement High School Program (DAP) to include four years in each of the core academic areas (English, social studies, math and science). Prior to this, only three years of math and science were required under those graduation programs. The SBOE also created two courses - Engineering and an Earth and Space Science. The TEKS writing process will begin shortly for those courses. The timeline for implementation of the 4X4 will have an immediate impact - next year's 9th graders may not count Integrated Physics and Chemistry (IPC) for the DAP. IPC will continue to count for the RHSP until the 9th grade class of 2012-2013; after this time IPC can be used as credit under the minimum plan only, which still requires only 2 credits of science. For the full text of the law and for a comparison of the graduation programs see the resources below. What I am more concerned about are the implications of the plan for classroom science teachers.

Teachers must become involved in the planning process for implementation of the new 4X4 requirements. The SBOE makes no recommendations for sequencing of science courses other than the stipulation that IPC be taken before the senior year. So, where will biology fall as a course in your district? Will students take biology as freshmen, or is your district looking at a physics first program? Will students take chemistry before or after biology? Will that chemistry course become more conceptual with less emphasis placed on math skills to allow success for students of all abilities? Will students with a higher level of math readiness be placed in Pre-AP Chemistry? Will your school offer Principles of Technology I as an alternative to physics (not an option under the DAP)? What electives will your students take for their fourth year of science? Does your school need to establish or enlarge its Advanced Placement program to meet the needs of the 4X4 plan and the requirement that each school offer at least 12 possible college credits to its students? Does your school have a dual credit program already in place that students could use as their fourth year? All those questions and more are just about sequencing and course offerings, tired yet?

Other questions we must ask ourselves involve the transition years. If you have ever taught in a school that moved a course from one grade level to another you are already aware of some of the issues we are about to face. If you have not been in that situation here is the scenario. For this example I am going to pretend IPC is currently taught in the 9th grade with some students taking Pre-AP Biology as 9th graders. Biology for this example high school is a 10th grade course. It's the year 2012 and now all your 9th graders on the RHSP and

(*continued on next page*)

In this issue ...

DAP will need to be taking Biology or Pre-AP Biology. All of your 10th grade students who took IPC in 2011-2012 as freshmen also need biology. Your numbers in biology have doubled, but it's only for this year; next year your numbers will double in chemistry. Who will teach all these extra sections of biology? Will those teachers then move to teach chemistry? What curriculum and support plans does your school/district have to help teachers who may not have taught or be comfortable teaching biology? How will you share equipment so that all teachers are meeting or exceeding the 40% lab requirement? How will you move microscopes from room to room as needed? Do you have enough dissection equipment? Do you need to have some teachers alter when they teach certain parts of the curriculum? Will you have enough textbooks and ancillary materials? How will your district handle the computerized testing of students taking the EOC? This brings us to the EOC exams.

End-Of-Course Exams

We know that the end-of-course (EOC) exams are here as an option for districts, and bills to replace TAKS with the EOCS are moving through the legislative process, What is not known is if EOCs will replace the TAKS. This year, schools selected by the Texas Education Agency (TEA), are giving the biology EOC as a field test, next year the test is slated to be optional while EOCs for chemistry and physics will be field tested. No data or questions from the field test will be distributed by TEA. The tests will be administered online only, consist of a similar number of questions as the TAKS, and will test ALL the TEKS. That is what is already happening.

What is being proposed? A bill has been filed in the Texas Senate by Senator Shapiro with a companion bill filed in the House of Representatives by Representative Eissler. This bill proposes eliminating TAKS at the high school level and replacing it with 12 tests for those students on the RHSP or DAP graduation plans. Students on the minimum plan would only take the EOCs for the courses they take. Students in any graduation plan would not have to pass every exam to graduate; instead they would need an average of a 70 on the exams they take – a cumulative total of 840 points across all exams. In science the courses tested would be biology, chemistry, and physics. There is language in the law that mentions performance on AP exams, SAT exams, and in dual credit courses as an option to taking the EOC, but no specifics are given. The proposed law would also require districts to use a student's EOC exam grade for a course as 15% of the final grade for the course. Questions would be included with-in the exams that would not count towards the student's performance which would be used to determine college readiness. All of the EOC exams would be administered via computer. All of these changes are proposed to start with students entering the 9th grade during the 2009-2010 school year. Remember, this bill is currently in committee and we are only able to report what is currently proposed. As with any legislation, we must wait for the final approval and nothing is for certain, but as science educators, we must be proactive in our thinking.

Teachers, curriculum specialists, and administrators alike must carefully review these bills and let their voice be heard. Watch for mention of these bills in the news to see what changes are being proposed or discussed. Watch closely as we near the end of the legislative term to see if this bill is enacted into law. Should this bill be enacted there are questions your school and district must consider. How can we familiarize our students with online testing to ease their anxiety? How will we logistically administer all these tests, on computer, to all our students, in the time allotted? How will we help students who do not reach proficiency level? Is our computerized grading system capable of incorporating the EOC grade into the final grade? Does your curriculum cover all TEKS or have you been focusing just on those that are TAKS tested? How will the EOC change when the TEKS are reviewed?

TEKS Review/Revision

At this time the science TEKS refinement process is expected to begin in the fall of 2008. How extensively the TEKS will change is not known but I can provide you with some questions you can ask to help your school adjust to the changes after they occur. How aligned to the TEKS is your current curriculum? What staff development plan will be needed to implement the changes? How will your curriculum be revised if necessary? What steps need to be taken to ensure that your curriculum is still vertically aligned? Have any TEKS been added that require your district to purchase new equipment? How can you be involved in the revision process? Finally a question I can answer. To become involved in the process, e-mail ***monica.martinez@tea.state.tx.us***.

A Call to Action

Now you know why I wake up at night thinking of all that needs to be accomplished. But then I remember all the great teachers who attended last years Port Aransas mini-conference and the standing room only TABT workshops at CAST 2006 in Wichita Falls and I am comforted. I know we have teachers with the leadership capacity to meet the challenges ahead but only if we all do our part. So, I call you to action. Become a leader on your campus, in your district, and help us improve biology education across the state. Mentor a new biology teacher and share those great strategies and activities you have in your file cabinets and binders. Offer to serve on a district curriculum writing committee, even when the pay is a few slices of pizza. Begin discussions about 4X4 implementation and help administration develop a plan that best meets the needs of all students while not limiting their potential. Open your classroom doors to pre-service teachers at local colleges to come observe and work with you – we are going to need these teachers desperately in a few years. Work with another teacher at that other small, rural district down the highway; who stands alone as the only biology teacher. Encourage your peers to join TABT and NABT so they too will have access to ideas and resources. Present a session as part of the TABT strand at CAST 2007. We need strong presenters, leaders, mentors, and teachers to meet the challenges we face because at the heart of it all we need to remember that we touch lives, we teach. We are in this profession for the students and we owe them our best.

Resources

For more information on the 4X4 plan including the text of the law and a side by side comparison of the graduation programs: ***http://www.tea.state.tx.us/curriculum/fourbyfour.html***.

Education Service Center has compiled a much more extensive list of questions for districts to use as part of the 4X4 implementation Process. This document can be found at ***http://www.esc13.net/cc/docs_2006_2007/Feb1/4by4%20issues.pdf***.

For the text and current status of SB1031 and HB2236 visit ***http://www.capitol.state.tx.us/Home.aspx*** and search by bill number. The tabs on the resulting page will give you the history, text, etc for this bill. At the time of this writing the bill had just been filed.

To sign up to present at CAST 2007 in Austin please visit ***www.statweb.org***. Deadline for submissions is April 30, 2007. TABT would like to have two strands of presentations so please sign up as part of our strand and then e-mail me at ***Jordan@esc13.txed.net***.

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Gravitropism – A Laboratory Exercise

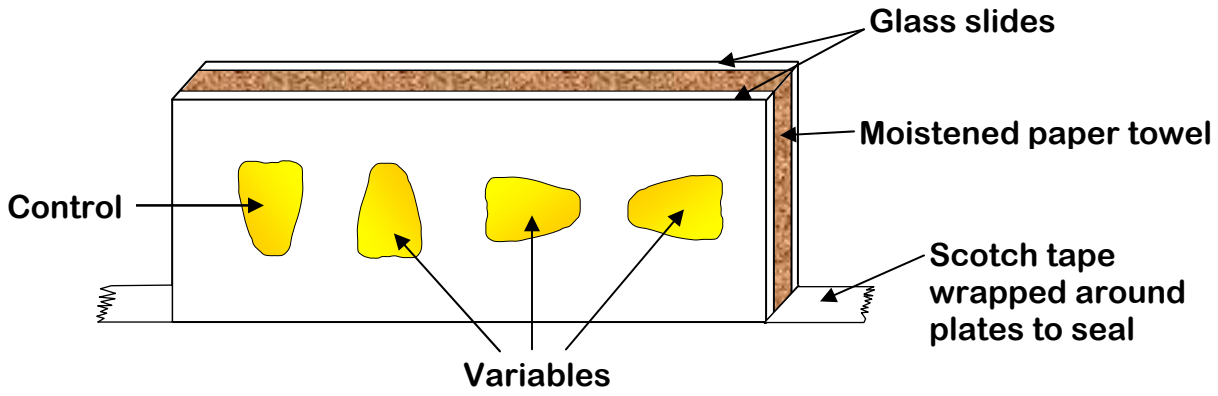
Because plants are solar-powered organisms, it isn't surprising that mechanisms for growing toward sunlight have evolved. Similarly, what environmental factor prompts the young root of a plant to grow downward? Roots grow downward in response to the Earth's gravitational pull. This is called gravitropism. Roots are positively gravitropic, while shoots are negatively gravitropic. The emerging root will always grow toward the pull of gravity, no matter what their initial orientation is. Likewise, shoots will grow up or away from the pull of gravity.

In this exercise, place 4 kernels of corn on top of moist paper toweling and sandwich them between two glass slides. Over the course of three days, observe the direction of root growth as the roots emerge from each seed.

Then, rotate the slides and watch to see how the direction of root growth changes.

Procedure:

1. Moisten a piece of paper towel with water and fold it to match the size of a glass microscope slide.
2. Place four kernels of corn on top of the paper towel, turning them so that they are arranged in four different directions: up, down, left side down, and right side down.
3. Place another microscope slide on top of the corn kernels.
4. Tape along three sides of the glass and paper towel sandwich and secure it to a Petri dish so that the kernels are standing upright.
5. Pour a small amount of water into the Petri dish and let them sit undisturbed for several days.
6. Every day, observe to see if the roots have emerged, and in which direction they are growing.
7. When instructed by your teacher, loosen the tape and turn the kernel sandwich 90 degrees.
8. Record changes in the direction of root growth.
9. Using the format provided by your teacher, create a lab write up that includes the following: Title, Introduction, Hypothesis, Materials & Methods, Discussion of Data & Results.



Modified from a lab activity in Linda Berg's textbook, ***Introductory Botany: Plants, People, and the Environment***.

Plant Hierarchy Model

By Debbie Richards

Models can be used effectively to move concrete learners to a better understanding of abstract concepts. The following describes how to produce an inexpensive, yet effective, model of the structural hierarchy of a typical C_3 plant leaf.

Materials: (per model)

2 pieces of green craft foam (cardstock or construction paper may also be used)
1 snack-size zippered plastic bag
adhesive tape

Model Construction:

1. Trace the patterns of the leaf, chloroplast, and thylakoid onto green fun foam, green card stock, or green constructions paper. Cut out each figure. Leave the thylakoid membranes of the grana attached to each other. (Do not cut the dotted lines.)
2. Fan-fold the thylakoid membranes along the dotted lines.
3. Tape the grana with its thylakoids to the chloroplast. See *Figure 1*.

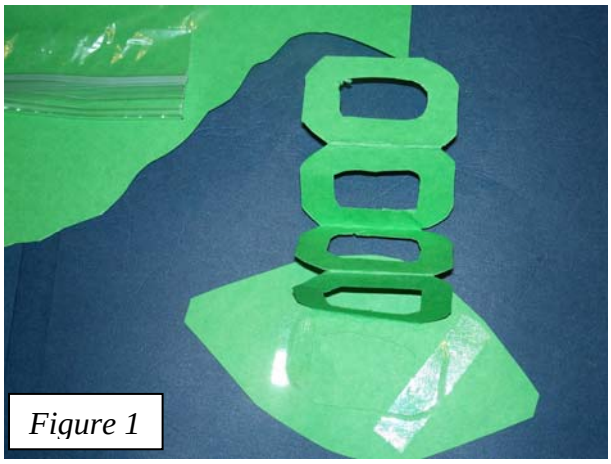


Figure 1

4. Place the thylakoid and chloroplast inside the snack-sized zippered bag.
5. Tape the zippered bag to the underside of the leaf. See *Figure 2*.

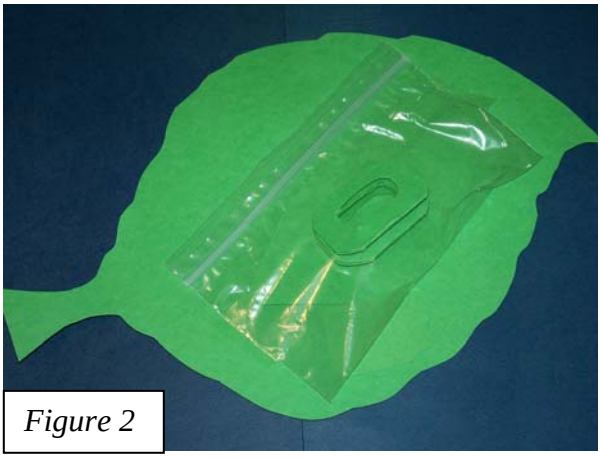
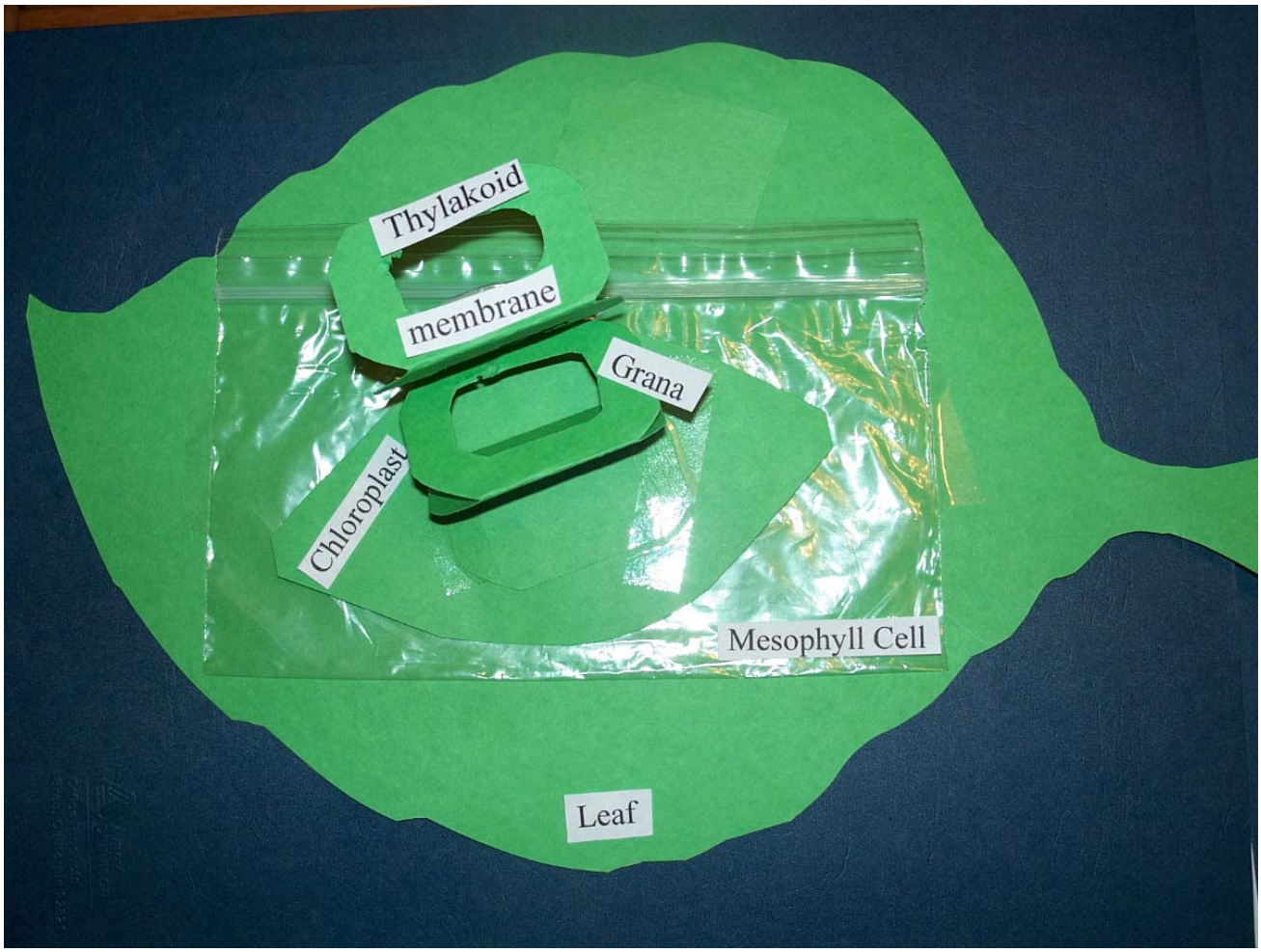


Figure 2

6. Identify each structure using the labels provided.



Use of the Model as a Class Activity

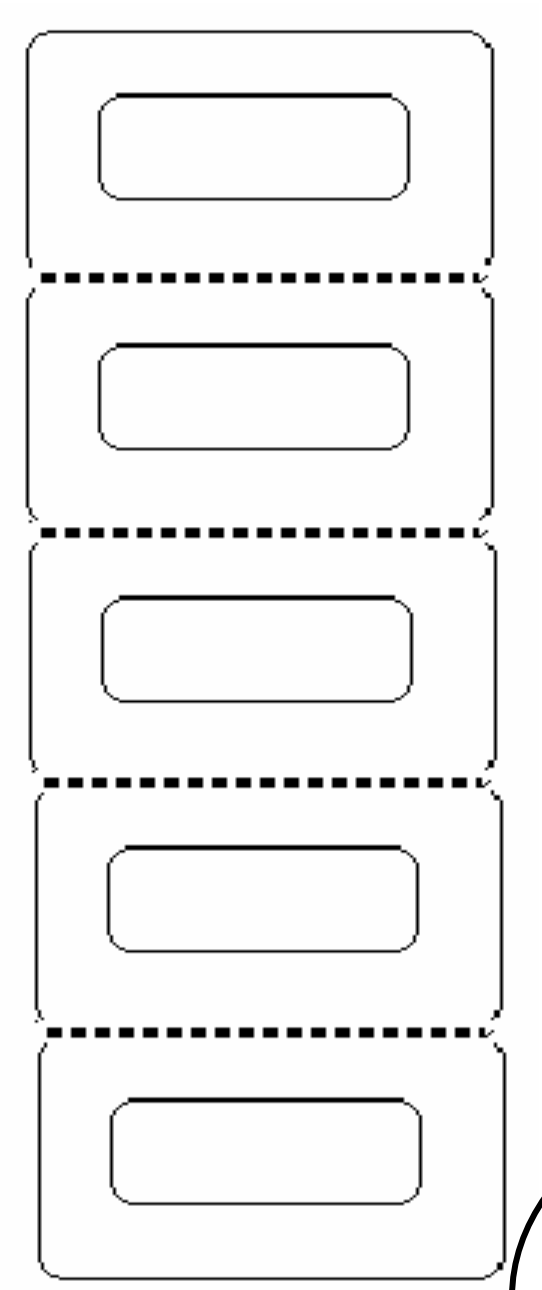
The low cost of this model makes it a reasonable activity for a typical first year biology classroom during a unit on photosynthesis or general plant anatomy. Although a pattern for the leaf is provided as a guide, students should be allowed and encouraged to use their innate artistic skills to draw their own leaf. This model can be incorporated into the "explain" portion of the 5-E model of science instruction by having group members take turns explaining the structural hierarchy of the leaf and exactly where the events of photosynthesis occur.

Use of the Model as a Teacher Demonstration

Creating the model from sheets of craft foam extends the life of the model. The use of craft foam is encouraged if you are planning to make a version of this model for use during teacher demonstration. Craft foam is available at most hobby stores and is often found in the craft section of popular discount variety stores.

Model Patterns

Grana of thylakoid



Hierarchy labels:

Leaf

Mesophyll Cell

Chloroplast

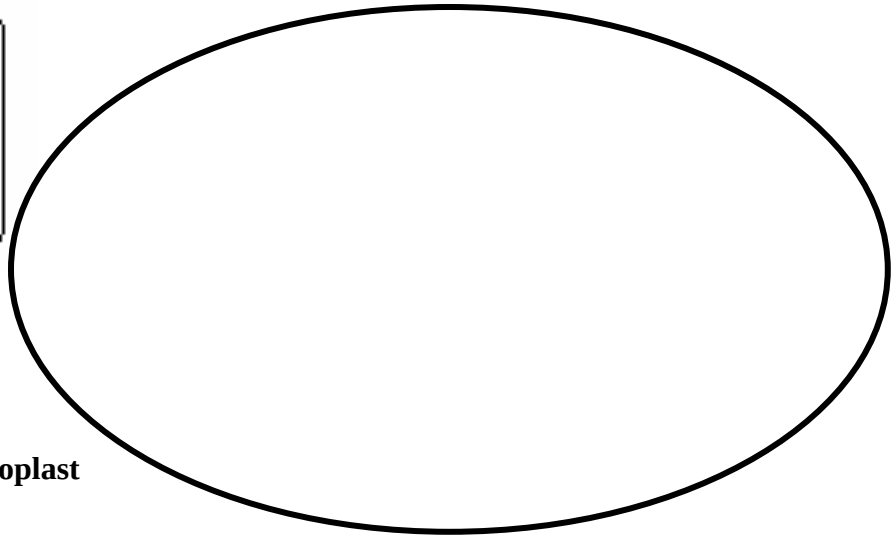
Grana

Thylakoid membrane

Organ

Cell

Cell Organelle



Chloroplast

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Texas Association of Biology Teachers

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