OBE Details from Dr. Yomanoi
Here are details you will need to fully prepare for the Origami Bird Extension

A. Read the research paper by Yomanoi et al, especially pp. 292-297 (“Improved “Origami Bird”...)
B. Study the two figures (1 and 2) on page 293. Fig. 2 text will be especially helpful (enlargement of image is attached).
C. Read Dr. Yamanoi’s answers to my questions about some details (below)

MY QUESTIONS to Dr. : Yomanoi: (Dr. Y's responses in blue); My additional comments in black.
1. >What wing dimensions are used. Westerling’s version uses wings that are 3 cm x 20 cm. Your Results handout starts with 2 cm x 20 cm. Also, what wing color do you start with? And, how far from each end (you said “edge”) of the straw is each wing placed? Paper clip number?
   Dr. Y: “I start with 2 cm x 20 cm wings. I start with blue wings (as shown in Results Handout for Parental Cross). Each wing is placed originally at 3 cm from each end of the straw. And we start with one paper clip at the leading end of the straw.”

2. >Just how were those roulette wheels constructed?
   Dr. Y: “We pasted the paper templates on cardboard and cut them out with a box cutter.”
   I would use a thumbtack for each spinner, head stuck through center and taped to back of the titled (white) template, and the colored spinner wheel’s center placed on the point of thumbtack so the point pierces the wheel, and can spin freely. Place tiny piece of cork or tape over the point for safety and so wheel stays on the tack. Repeat for the other wheel.

3. >What do you use for making the rotatable bases on that DNA diagram?
   Dr. Y: “Small wood cubes (1/2 inch or 13 mm max), on which you can mark the letters.”
   You would need a minimum of 5 cubes per team x 8 teams (4 students per team) = 40 cubes for a class of 32 students. [Only 5 cubes are needed because it’s not necessary to display the matching nucleotides in the lower strand; just use the 5 cubes in the upper strand].

They might be available at the RAFT (Resource Area For Teachers). Do Google search for one closest to you. They are currently located in San Jose, Redwood City and Sacramento, CA, and Denver, CO. You could call and ask if they have something close in size and quantity, their cost, and could they send them to you. I recently checked at local [San Jose] RAFT, found packages of 100 blank wooden 1cm cubes for $2.00 – a great deal. However, I understand that the source for those cubes is discontinuing their supply. Don’t know how many packs the RAFT has at the moment. I would call and order a pack or two ASAP. If they are out of those cubes, ask about their packets of 1cm white plastic cubes; it’s a kit for demonstrating a cubic decimeter, called “Purple Base 10 Block,” and has 100 cubes (plus folded cardboard decimeter, etc). But it only costs $5.00. Not as cheap as the wooden cubes, but should work.

RAFT also has 15mm blank plastic dice: packet of 12 for $1.00 (plus postage). Four packets (48 cubes) for $4.00. They’re a little large, but would work OK.

You could also check out this supply place: http://www.greathallgames.com/aacc/adice/adiceBlank.html
They charge .25 each (plus postage?) for 13 mm or ½” blank wooden cubes, or 10 mm (1 cubic cm) cubes. These are very pricey ($10 + postage for 40, but they look just like the wooden ones from the RAFT. You might call them to see if they could give you discount for a larger quantity.

You will need to carefully label each cube’s four contiguous sides with the letters: A, T, C, and G (leave two opposite “ends” blank). I used an Extra Fine Point black Sharpie Permanent Marker.
4.> I assume that a different “Results Handout” was used for each generation (in each team), is that correct? Dr. Y: “I gave one "Results Handout" sheet to each student group [team]. Students record results for four generations.”

I have a “Results Handout” (for P, F1, and F2 generations), and a “Results Handout Part 2” (for the F3 and F4 generations). One small typo, several times in all the tables on both sheets, is the word “edge” where it should be “end” [of the straw]. I will correct that in future versions of these Results Handouts.

5.>What base sequence does Dr. Y start with in the Gametes Mutation Box DNA?

Dr. Y: “Start with the sequence shown for the single P generation [Results Handout 1: A, G, C, T, A]”

I would leave the corresponding blanks in the lower DNA strand (blue strand) empty. We can assume that only one strand is being read, so keep it simple by working with just the upper (green) strand.

ATTACHMENTS (9):
OBE.Details.pdf
OBE.Paper.pdf
OBE.GamMutBox+DNA.pdf
OBE.selectpat.pdf
OBE.RouletteWheels.pdf
OBE.mut.tab.pdf
OBE.Results1.pdf
OBE.Results2.pdf
OBE.WS.Hoekstra.pdf

Contributions by teacher Nathan Hoekstra:
I did in fact use the materials you provided. I have a PowerPoint, but it’s just a couple of slides with pictures of the student handouts so that I could explain them to the class and go through an example. I also developed a 2-page worksheet handout with instructions and Analysis Questions [attached]

Students enjoyed flying their birds. I think the key concept communicated to students during this activity was that populations, not individuals, evolve, and that this is due to genetic mutations leading to some birds having a better chance of survival. Overall a success. I used this during my Evolution unit, which comes after the DNA and Genetics units.

TEACHERS USING/ADAPTING THIS LESSON: If you develop any modifications/improvements for use in your classes, please share with the ENSI webmaster for inclusion in future revisions.