

## Outline of Content (Scope and Sequence)

**Date Sequence (In 55 minute Days):**

**Day #**

**1-5** Assemble sample Ornithopter in groups

1. Deliver introductory lesson and show video clips of Ornithopters in flight
2. Safety Demonstrations for Glue Gun, Scroll saw and Drill Press with lesson for body construction techniques. Safety Tests at end of activity.
3. Work Day
4. Wing construction lesson – prepare oval template in advance as per instruction sheet and assemble a few material options
5. Lesson on motor construction and make motor pieces and assemble overall Ornithopter. Pre-make base pieces for crank and rear clip to save time for the students. Pre-cut aluminum tube to save time and material as well.

**6** Test fly to investigate flight properties

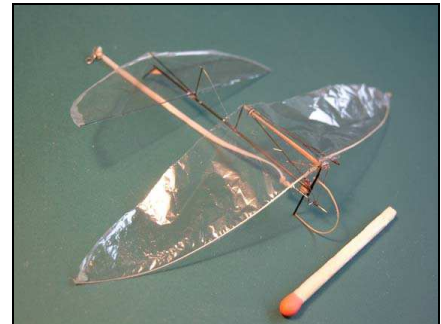
**6** Research Ornithopter designs. Create a mind map of the elements of a successful design.

6. Lesson on ideation and research suggestions

**7-8** Create 12 thumbnail sketches and Refine 3 sketches into development drawings.

7. Work Day

8. Work Day



**9-10** Produce one 3-D rendering of your final design and highlight innovations. Get your design checked and approved by the instructor.

9. Lesson on 3-D rendering

10. Work Day

**11** Produce a diagram of each part of your design and a template for your wings then photocopy templates.

11. Lesson on orthographic drawings for creating parts drawings

**12-14** Use spray-adhesive and paste a copy of your diagram to the balsa blanks.

Carefully cut out and join your balsa frame together.

12. Work Day

13. Work Day

14. Work Day

**15-16** Make your crankshaft then make your wings out of your material choice and adhere to frame.

15. Work Day

16. Work Day

**17** Assemble Ornithopter and Fit elastic band then decorate as desired.

Carefully test fly in open area (ask instructor first).

17. Work Day/Test Day

**18** Race Day – Pick a day when maximum exposure of the program can be achieved, maybe outside class time for better recruiting.