FLIGHT OF FANCY · 7TH GRADE · VISUALIZATION CHALLENGE

Planning Guide

Duration: ~7 Class Periods | Grade 7

Activity Overview and Pacing

Activity	Name	Day	Time	Essential Question
1	What is 3D Modeling?	Day 1	~50 min	How do engineers use digital tools to design real things?
2	Measuring the Glider	Day 2	~50 min	How do measurements translate a physical object into a digital one?
3	Modeling the Stabilizers	Days 3–4	~100 min	How do we build an accurate 3D shape from measurements?
4	Modeling the Wings and Fuselage	Days 5–6	~100 min	How do we model more complex shapes — and what do we do when it gets hard?
5	Assembly and Reflection	Day 7	~50 min	Does our digital model match the real thing?

Activity Descriptions and Materials

Activity 1 — What is 3D Modeling? | Day 1 | ~50 min

Essential Question: *How do engineers use digital tools to design real things?*

Students are introduced to 3D modeling software and its role in engineering. They explore TinkerCAD basics through guided exercises, learning to place, resize, and move simple shapes.

Materials:

- Computers with TinkerCAD access
- Student activity sheets

Activity 2 — Measuring the Glider | Day 2 | ~50 min

Essential Question: *How do measurements translate a physical object into a digital one?*

Students use calipers and rulers to measure each part of the cardstock glider — vertical stabilizer, horizontal stabilizer, wings, and fuselage — and record all dimensions in their measurement sheet.

Materials:

- Foam gliders (from the Data Challenge; 1 per team)
- Digital calipers and/or rulers
- Student measurement sheets

Activity 3 — Modeling the Stabilizers | Days 3–4 | ~100 min

Essential Question: *How do we build an accurate 3D shape from measurements?*

Teams model the vertical and horizontal stabilizers in TinkerCAD using exact measurements from Activity 2. They practice scaling, positioning, and comparing digital shapes to the physical parts.

Materials:

- Computers with TinkerCAD access
- Completed measurement sheets
- Physical gliders for reference

Activity 4 — Modeling the Wings and Fuselage | Days 5–6 | ~100 min

Essential Question: *How do we model more complex shapes — and what do we do when it gets hard?*

Teams model the wing(s) and fuselage in TinkerCAD. The fuselage introduces more complex shaping. Students iterate on their models and consult their measurement sheets to verify accuracy.

Materials:

- Computers with TinkerCAD access
- Completed measurement sheets
- Physical gliders for reference

Activity 5 — Assembly and Reflection | Day 7 | ~50 min

Essential Question: *Does our digital model match the real thing?*

Teams assemble all modeled parts into a complete glider in TinkerCAD and do a final comparison between their digital model and the physical glider. They reflect on accuracy, challenges, and engineering applications of 3D modeling.

Materials:

- Completed individual TinkerCAD parts
- Physical gliders
- Student activity sheets

Standards Alignment

This unit was designed to support the Next Generation Science Standards (NGSS) Engineering Design performance expectations and Science & Engineering Practices, and the Common Core State Standards for Mathematical Practice (SMP). The tables below summarize the strongest alignment points and where they show up in the challenge. The NGSS engineering design performance expectations map cleanly to most state engineering and technology standards. If your state uses different standards (e.g., Georgia Standards of Excellence, TEKS, NYS Next Generation Standards), align using the descriptions in the tables below.

NGSS Engineering Design Performance Expectations

Standard	Description	Where It Shows Up	Classroom Connection
MS-ETS1-2	Evaluate competing design solutions using a systematic process.	Activity 5	Students evaluate their 3D model against the physical glider as a standard, assessing accuracy and identifying discrepancies.

Science and Engineering Practices

Standard	Where It Shows Up	Classroom Connection
Practice 3: Planning and Carrying Out Investigations	Activity 2	Students systematically measure each glider part, recording all dimensions in a structured measurement sheet.
Practice 5: Using Mathematics and Computational Thinking	Activities 2–4	Students apply precise measurements and spatial reasoning to build accurate digital models.
Practice 8: Obtaining, Evaluating, and Communicating Information	Activity 5	Students compare digital and physical models, evaluate accuracy, and communicate their findings.

Common Core Standards for Mathematical Practice

Standard	Where It Shows Up	Classroom Connection
SMP 1: Make Sense of Problems and Persevere	Throughout	Building an accurate 3D model requires sustained effort and iteration across multiple sessions.
SMP 5: Use Appropriate Tools Strategically	Activities 2–4	Students choose and use calipers, rulers, and TinkerCAD purposefully for different measurement and modeling tasks.
SMP 6: Attend to Precision	Throughout	Accurate measurements are critical — small errors compound as parts are assembled into a complete model.

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