TUMBLEWINGS

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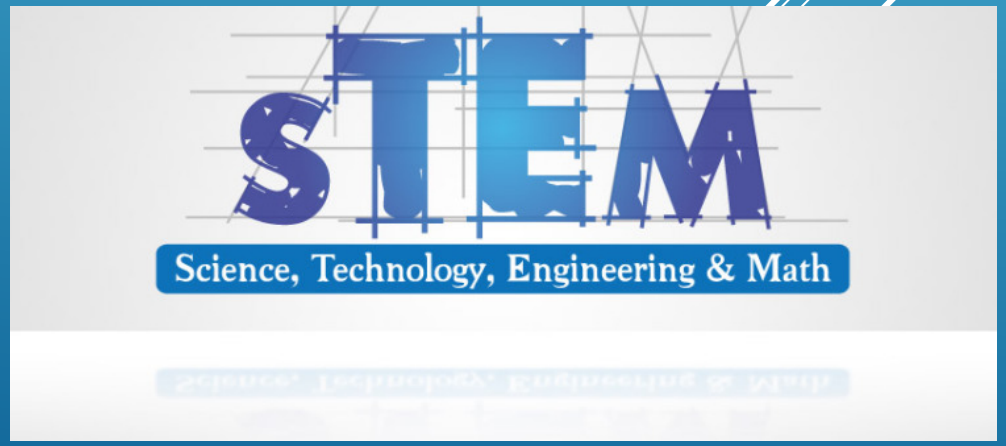
WHAT IS INTEGRATIVE STEM?

"**technological/engineering** design-based learning approaches that intentionally integrate the concepts and practices of **science** and/or **mathematics** education with the concepts and practices of **technology** and/or **engineering** education."

(Sanders & Wells, 2010, p. 1)

HOW ARE TUMBLEWINGS INTEGRATIVE STEM?

During this activity you will complete a Technology & Engineering Education design challenge which incorporates principles and practices of Science and Mathematics.



WHAT IS A TUMBLEWING?

A **tumblewing** is a type of glider or kite which rotates about an axis and exhibits **lift** as the tumblewing alternates between **flying** and **stalling (free fall)**. One common example of a tumblewing is confetti which "tumbles" as it falls. The alternating flying and stalling of the confetti creates the visual appeal.

OUR OBJECTIVES

Students will explore different **measurements and ratios** and their overall impact on the tumblewing's flight (MATHEMATICS & SCIENCE)

Students will work through a **Technology & Engineering Design Challenge** to design, construct, test, modify, and re-test their tumblewing (TECHNOLOGY & ENGINEERING DESIGN BASED LEARNING).

THE ENGINEERING DESIGN CHALLENGE

Construct a tumblewing that travels the furthest distance

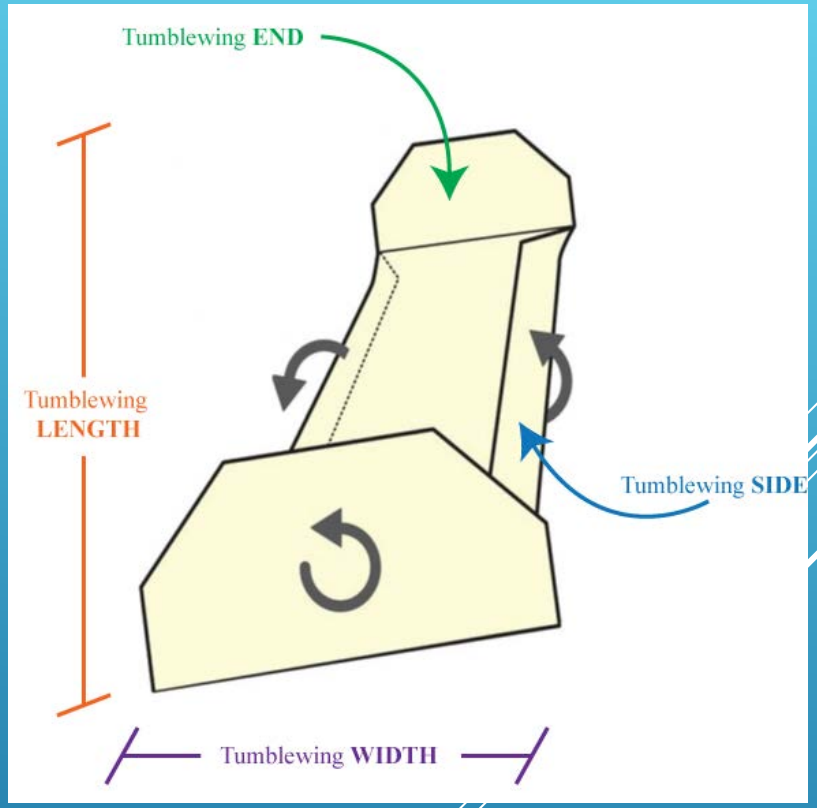
- **Competency-based Evaluation**
  - 10+ Points: Flies the furthest distance
  - 10 Points: Built and flies more than 30’ (9.1 meters)
  - 9 Points: Built and flies less than 20’ (6.1 meters)
  - 5 Points: Not completed or launched - effort shown.
  - 0 Points: No effort shown.

PRACTICES OF SCIENCE & ENGINEERING

Test, Evaluate, Analyze, Interpret, & Make a Decision

Test only one variable (change) at a time.

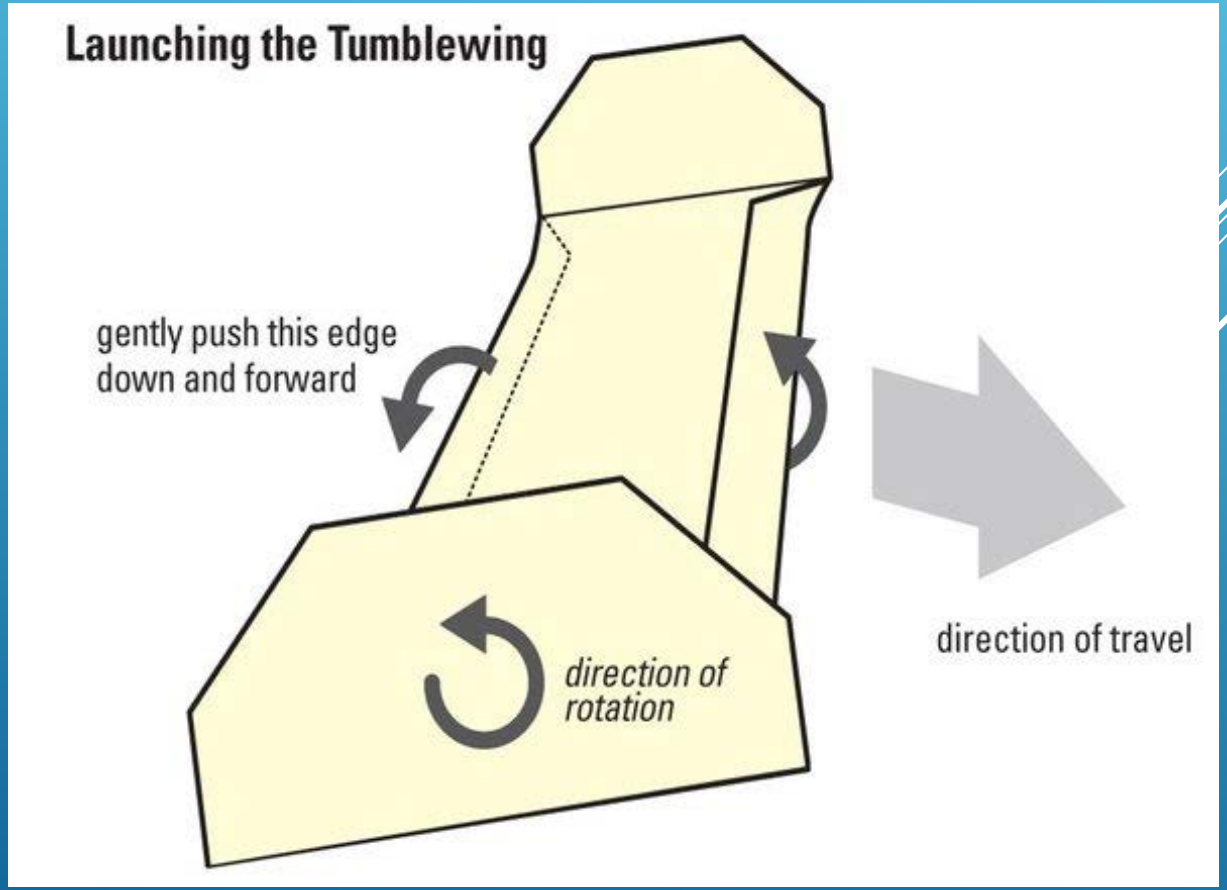
For example, choose a set fold measurement for the **ends** and test the **side** folds at different measurements. Then choose the best fold for the **sides** and test the **ends** at different measurements. By holding all variables except for one constant we can better see the impact of a single change in the tumblewing!



Trial #	Length of tumblewing	Width of tumblewing	Fold length (ends)	Fold length (sides)	Results (how far did it go)
Ex. 1	5”	2”	¼”	1/8”	12’
Ex. 2	5”	2”	½”	1/8”	10’
Ex. 3	5”	2”	1”	1/8”	9’’

FINAL TIPS

1. Use a pen to crease the fold edges
2. Launch with the side-folded **up** towards you
3. Don't tilt the cardboard (this eliminates your ridge lift)
4. Have fun – don't get frustrated if it takes some time to master



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