



# TeachEngineering

STEM Curriculum for K-12

Scrub the Scum, Save the Shine – Prototype Testing Procedure



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## Your goal:

Create a motor-driven brush that:

- (1) Maximizes the ability to shine/clean a surface.
- (2) Minimizes wear on the surface.

This is how you will test to see whether your prototype accomplishes your engineering design goals.

# Individual Prototype Testing

# Test 1: Scrub the Scum

## Gather materials:

- 4 metal “coins”
  - 1 piece of solid cardboard
  - double-sided tape
  - 1 dry erase marker
  - timer
  - Prototype Testing worksheet
  - your prototype
- Find a clear, dry, space to work.

# Test 1: Scrub the Scum

Step 1:

Attach your four coins to the cardboard by placing a small piece of double-sided tape on the back of each coin.

## Test 1: Scrub the Scum

Step 2:

Carefully use the dry erase marker to completely cover the top surface of each coin.

This marker cover is what your prototype will clean off the coin during the test.



# Test 1: Scrub the Scum

Step 3:

Place your prototype on top of one of the coins. Use your fingers to make a barrier on the edge of the coin so the prototype will not fall off when turned on.

**NOTE:** Do NOT press down on your prototype. The only force should come from the motor acting.

# Test 1: Scrub the Scum

Step 4:

Start the timer at the same time you turn on your prototype by attaching the motor to the battery.

**NOTE:** You will be timing your prototype as it acts for 2 minutes on one coin. Do not press down on your prototype!



# Test 1: Scrub the Scum

Step 5:

After 2 minutes, turn off your prototype by detaching the battery from the motor.

Remove your prototype from the coin surface.

# Test 1: Scrub the Scum

## Step 6:

Evaluate how well your prototype cleaned the coin by comparing the appearance of the coin with the pictures on your testing evaluation guide:



# Test 1: Scrub the Scum

Step 7:

Record your data on your prototype testing worksheet.

Scum Scrubbing Visual Evaluation		
Trial #	Sketch or Picture	Estimated % Cleaned

Repeat Steps 3 – 7 for the remaining coins.

# Group Prototype Testing

# Assign Group Roles

## Materials Manager

*Gather & return supplies, set up equipment, and use fingers to keep bot in place for testing.*

## Data Recorder

*Observe and record test data on worksheet.*

## Measurement Guru

*Start and stop the timer to ensure accuracy in testing; collaborate with team for measurements.*

## Electrician

*Connect and disconnect the battery to start and stop the motor.*

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- Find a clear, dry, space to work.

# Test 1: Scrub the Scum

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## Test 1: Scrub the Scum

Step 2:

Carefully use the dry erase marker to completely cover the top surface of each coin.

This marker cover is what your prototype will clean off the coin during the test.





# Test 1: Scrub the Scum

Step 3:

Place your prototype on top of one of the coins. Use your fingers to make a barrier on the edge of the coin so the prototype will not fall off when turned on.

**NOTE:** Do NOT press down on your prototype. The only force should come from the motor acting.

# Test 1: Scrub the Scum

Step 4:

Start the timer at the same time you turn on your prototype by attaching the motor to the battery.

**NOTE:** You will be timing your prototype as it acts for 2 minutes on one coin. Do not press down on your prototype!

# Test 1: Scrub the Scum

Step 5:

After 2 minutes, turn off your prototype by detaching the battery from the motor.

Remove your prototype from the coin surface.

# Test 1: Scrub the Scum

## Step 6:

Evaluate how well your prototype cleaned the coin by comparing the appearance of the coin with the pictures on your testing evaluation guide:



# Test 1: Scrub the Scum

Step 7:

Record your data on your prototype testing worksheet.

Scum Scrubbing Visual Evaluation		
Trial #	Sketch or Picture	Estimated % Cleaned

Repeat Steps 3 – 7 for the remaining coins.

## Test 2: Save the Shine

### Gather materials:

- 4 metal “coins”
  - 1 piece of solid cardboard
  - double-sided tape
  - 1 dry erase marker
  - timer
  - Prototype Testing worksheet
  - your prototype
- Find a clear, dry, space to work.

## Test 2: Save the Shine

Step 1:

Carefully remove the outer foil layer from one of the coins.

## Test 2: Save the Shine

### Step 2:

Carefully measure the thickness of the coin with the cover removed by using the ruler or calipers. Record the original thickness in the data table on your prototype testing worksheet.

Scum Scrubbing Visual Evaluation		
Trial #	Original Thickness (mm)	Thickness after Testing (mm)



## Test 2: Save the Shine

### Step 3:

Carefully place the coin into one of the slots in your coin holder OR, if using cardboard, place a piece of double-sided tape on the foil-covered side of your coin and attach the foil side to the cardboard so the uncovered side is facing up.

## Test 2: Save the Shine

### Step 4:

Place your prototype on top of the coin that has the foil cover removed. Use your fingers to make a barrier on the edge of the coin so the prototype will not fall off when turned on. **NOTE:** Do NOT press down on your prototype. The only force should come from the motor acting.

## Test 2: Save the Shine

Step 5:

Start the timer at the same time you turn on your prototype by attaching the motor to the battery.

**NOTE:** You will be timing your prototype as it acts for 2 minutes on one coin. Do not press down on your prototype!

## Test 2: Save the Shine

Step 6:

After 2 minutes, turn off your prototype by detaching the battery from the motor.

Remove your prototype from the coin surface.

## Test 2: Save the Shine

Step 7:

Carefully remove the coin from the holder.

Suggestion: Use the palm of your hand to cover any coins that remain in the holder and turn the holder over to dump the coin you just used for the test onto a flat surface.

## Test 2: Save the Shine

Step 8:

Use the ruler or calipers to measure the thickness of the coin in **millimeters**.

NOTE: If the thickness varies at different points of the coin, estimate the thickness at the most worn (i.e., thinnest) point.

Scum Scrubbing Visual Evaluation		
Trial #	Original Thickness (mm)	Thickness after Testing (mm)

## Test 2: Save the Shine

Step 9:

Repeat Steps 1- 8 for the remaining coins.