

# "A Stack of Coins and an Index Card"

Tehani Finch, Howard University GK12 Program

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## I. DCPS Standards:

8.1.2 Test hypotheses that pertain to the content under study.

8.1.5 Write clear step-by-step instructions (procedural summaries) for conducting investigations.

8.7.6 Know that the greater the mass of an object, the more force is needed to change its motion.

## II. Goals:

Students will understand what it means to test a hypothesis.

Students will appreciate the concept of inertia.

## III. Objectives:

Students will formulate a hypothesis, and test it.

Students will explain the difference in two physical scenarios in terms of inertia.

## IV. Prerequisite Knowledge:

A. **Hypothesis** - An educated guess about the outcome of an experiment; part of the Scientific Method.

B. **Friction** - Friction is a force between objects that resists relative motion between them. Strictly speaking, the heat generated by frictional interactions is not friction itself; the heat is due to the unordered work done by friction. On a microscopic level, friction is caused by surface adhesion.

C. **Inertia** - Resistance to change in motion of a material body.

V. Essential Questions:

What is the difference in response between a single coin and the stack of coins? Was the hypothesis confirmed?

VI. Materials: One index card, four coins (typically pennies)

VII. Differentiating Instruction: English language speakers should have no problems with this activity.

VIII. Rationale: This activity allows students a chance to formulate and test a hypothesis about a simple phenomenon.

IX. Activity Procedure: Students will attempt to pull the index card from beneath a coin, first quickly, then slowly. Later, the process is repeated for a stack of coins.

Students formulate hypothesis (i): Students are asked to write their own hypothesis down about what will happen. The procedure is repeated with two pennies and then with all four pennies.

Students perform exercise (i): Students begin exercise while instructor asks what's different between the slow pull and the fast pull? Was the hypothesis confirmed or not?

Students formulate hypothesis (ii): Students are asked to write their own hypothesis down about what will happen when the number of pennies increases.

Students perform exercise (ii): Students continue exercise; instructor asks if the second hypothesis is confirmed or not? [A fast pull often leaves the stack relatively undisturbed]

X. Evaluation and Assessment: The students record whether or not their hypotheses were confirmed and asked what does this experience teach them about hypotheses and the need for experiments? Based on the notions of friction and inertia, students are asked to analyze their results and what they learned; afterward they are given guidance on the accepted scientific explanation, which they also write in notebooks [Briefly, there is less friction for a fast pull; however, a stack of coins has more friction but also more inertia than a single coin].