

STUDY HALL ACTIVITY

Card Drop Exercise

A two-minute demonstration of what happens when you tamper with a process that is only showing common cause variation.

Overview

This exercise demonstrates the concepts of over-control and tampering in response to common cause variation. Participants drop playing cards onto a target and, almost without exception, re-aim after every drop to correct for the last result — adding variation to a process that was never under their control in the first place. The exercise is quick and easy to perform, and requires minimal materials.

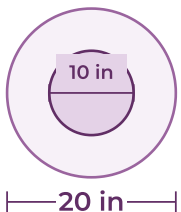
LEARNING OBJECTIVE

Following the exercise, participants will be able to distinguish common cause from special cause variation, and explain why adjusting a stable process in response to common cause variation increases variation rather than reducing it.

MATERIALS NEEDED

- A pack of playing cards or business cards
- A marker to draw the targets
- Three sheets of poster board or flip chart paper
- Floor space for three drop stations

TARGET DIMENSIONS



On each sheet of flip chart paper, draw two concentric circles: an inner circle roughly **10 inches** in diameter and an outer circle roughly **20 inches** in diameter. The inner circle is the bulls eye.

TIME NEEDED

15–20 Minutes

PARTICIPANTS

Any Group Size

DROPS PER STUDENT

Ten

APPLICATION

Common Cause Variation
Special Cause Variation
Over-Control and Tampering
Process Capability
Process Improvement

FACILITATOR NOTE

Some cultures may be offended by playing cards. Business cards can be substituted.

Running the Exercise

Set up the targets before the session starts. The card is held vertically in the first run — that is what makes it flutter off target, and it is the detail the whole exercise depends on.

1 Draw the targets

On three large pieces of flipchart paper, draw two concentric circles. The inner circle should have a diameter of about 10 inches, and the outer should have a diameter of about 20 inches.

2 Set up the drop

Place the sheets on the floor and have a student stand next to each sheet. Have the first student hold their arm stretched straight out over their bulls eye circle. Have them hold a card on edge — so the card is vertical — aim carefully, and drop the card towards the target. Emphasize the careful aiming to make sure they overcompensate after each drop.



The card is held vertically for the first run — this is what makes it flutter.

3 Repeat ten times and watch closely

The card will flutter around and almost always miss the target. Repeat ten times and watch the student closely — are they moving their arm each time to compensate for the last drop?

4 Compare a second student

Almost all students will re-aim after each drop, trying to compensate for the last direction the card fluttered. If they don't, pick a second student to repeat the exercise so you can compare the two.

Debrief

What did you see?

Did the class notice the student re-aiming between each drop? Almost all students will tamper with the process and attempt to aim the drop based on the outcome of the previous drop.

Is the fluttering something the process can control?

The answer is no — it is common cause variation, inherent to the process as it is currently designed.

Why does tampering make it worse?

Explain the concept of common and special cause variation. Point out that tampering with a process in response to common cause variation will almost always increase the variation in the process, not reduce it.

Key Learning Points

Use these questions to move the class from variation to capability, and from tampering to actual process improvement.

- At this point, you can also begin the discussion of process capability. Is this process capable? Probably not — but that is dependent on the customer specifications. How many cards does the customer expect in the inner or outer circles?
- If the process is not capable of meeting customer expectations, is any amount of tampering with the process going to improve the outcome? Most likely not.
- Ask the class what improvements could be made to make this process more capable? The improvement is to hold the card horizontally, not vertically. When held horizontally, the card falls almost perfectly straight to the target. The process becomes capable, and there is no longer a desire to tamper with the process.

Demonstrating the Improved Technique



Held from below

Not very accurate for release of the horizontal card — the card often dips as it is dropped.



Held from above

Holding the card from above results in the most accurate drop and the best process improvement.

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