

Teacher Overview

This experiment uses student participation to teach the concept of diminishing marginal returns. Students are told they will be the employees in a widget factory. This game works equally well in small classes (less than 30 students) and also large lectures (more than 250 students). You will need enough space to place the buckets 16-20 feet apart. If you do not have a large room, you may want to complete the activity in the hallway, outside or in the gym.

When to Use This Lesson

This lesson should be used during the Economics Unit and/or before Market Day.

Time



USES STUDENT PARTICIPATION TO
TEACH THE CONCEPT OF DIMINISHING
MARGINAL RETURNS

BEFORE CLASS PREPARATION

- > Get enough tennis balls to complete the activity, 2 buckets, and small white boards or another method for recording results. **ProTip:** you can use pens or other objects if you do not have tennis balls
- > Draw the example schedule on a white board for the output recorder.
- > Principled Entrepreneurship LO 4 may be used for a student friendly learning objective if explained to the students. PE LO 4: Students will learn how to apply economic problem-solving skills to real world problems in order to create value in society.

LEARNING OBJECTIVES

- > Principled Entrepreneurship LO 4d, 4g, 4h

KEY TERMS

- > Diminishing marginal returns
- > Sunk cost
- > Marginal analysis

FOUNDATIONAL VALUES

- > Sound Judgment
- > Win-Win Focus
- > Be Principled
- > Knowledge

MATERIALS

- > 24-36 tennis balls
- > 2 five-gallon buckets
- > Whiteboard or other method for recording results
- > Approximate cost of materials: \$15.00 plus student incentives

ACTIVITY INTRODUCTION

- > Tell students that they are part of the inputs required to generate a factory's short-run production function. They will be using two buckets, a number of tennis balls and a whiteboard to record the results of the exercise.

ACTIVITY DIRECTIONS

To start the activity you will need to set up and assign the following:

- > 4 volunteers
 - One student to act as the factory owner (optional)
 - One student to act as timekeeper
 - One student to act as output recorder - who can record the information on the classroom whiteboard or on their own. This is up to your discretion.
 - One student volunteer to be the first production line employee at the widget factory
- > Set the buckets approximately 16-20 feet apart
- > Place all the tennis balls in one bucket
- > All other students that participate become workers on the 'production line'.

Round One

- > The first 'volunteer' (or you may assign a student) is told they need to pick up one ball (widget) at a time and move it to the other bucket, place it in the bucket and then return to the first bucket to collect the next ball (widget). The goal is for him/her to transfer as many tennis balls as possible from bucket one to bucket two in 30 seconds.
- > A worker can only handle one ball (widget) at a time and they must treat them like eggs. If he/she drops a ball it is broken and not worth attempting to pick up.
- > The goal is for them to transfer as many tennis balls as possible from bucket one to bucket two in 30-seconds, the timekeeper sets the 30 second timer.
- > At the end of this time the total number of balls (widgets) transferred from bucket one to bucket two are counted and recorded on the schedule. Ask the Owner how they feel after round one. Are they satisfied with the production? Record the owner's response using emoji faces on the white board. The balls are then all returned to Bucket One ready for the next round.

Round Two

- > A second volunteer is added to the production line.
- > The process is the same but the production of widgets needs to increase. Each employee needs to handle each widget and each employee can only handle one widget at a time.
- > The students can come to a decision on what their process for production is. However, after they have made a decision they must continue with that process for the remainder of rounds. You can ask the owner to assist the employees on their decision. This is done to keep the focus on the marginal returns rather than improving the process.

ACTIVITY DIRECTIONS CON'T

- > Example of production line: When there are two workers, they each only have to take the ball half the distance. This first worker will pick up the ball from bucket one, meet the second worker halfway and pass the ball on to that worker. As soon as this handover is made the first worker is able to return to bucket one to get another ball while the second worker takes the first ball to bucket two and delivers it.
- > At the end of each 30 second round the number of widgets produced is counted and recorded on the schedule. Ask the Owner how they feel after the round. Are they satisfied with the production? Record the owner's response using emoji faces on the white board.
- > Continue with rounds until negative returns can be demonstrated.

Additional Rounds

- > As more workers join the production line (in each additional round), each worker has less distance to travel and very quickly they are able to stand still and just pass the balls from one worker to the next.
 - Each student must handle every ball on each run.
 - At the end of each thirty second period the balls are counted and returned to the first bucket. The work that each successive group of workers completes constitutes one point of the production function.
- > Continue the 30-second rounds of the activity until negative returns can be demonstrated.
- > Continue to ask the owner for their opinion/feelings. Ask the students why the owner's feelings are changing. Relate the way the owner is feeling to the students' market day and whether or not they have friends helping them.

EXAMPLE SCHEDULE:

LABOR	TOTAL PRODUCT	TOTAL BROKEN	AVERAGE PRODUCT	MARGINAL PRODUCT	OWNER'S FEELING
0	0	0	0	0	
1	9	0	9	9	:)
2	15		7.5	6	:)
3	23		7.67	8	:-
4	26		6.5	3	:-(
5	26		5.2	0	:-\
6	24		4	-2	:-\

Labor
= number of student participants

Total Product
= number of tennis balls (widgets) successfully transferred from bucket one to bucket two

Total Broken
= number of tennis balls (widgets) dropped (broken) in each round

Average Product
= total product divided by labor

Marginal Product
= change in total product divided by change in labor

Owner's Feeling
= how the student volunteer, acting as the owner, feels at the end of each round.

