

# Workshop on “Teaching Supply Chain Mgmt. via Games”

## Hunger Chain



Mummy bird only has one worm, whom to give it to?

*Flora* **PARK**



A Supply Chain Contracts and  
Collaboration Simulation

# **Hunger Chain - A Competitive Supply Chain Simulation**

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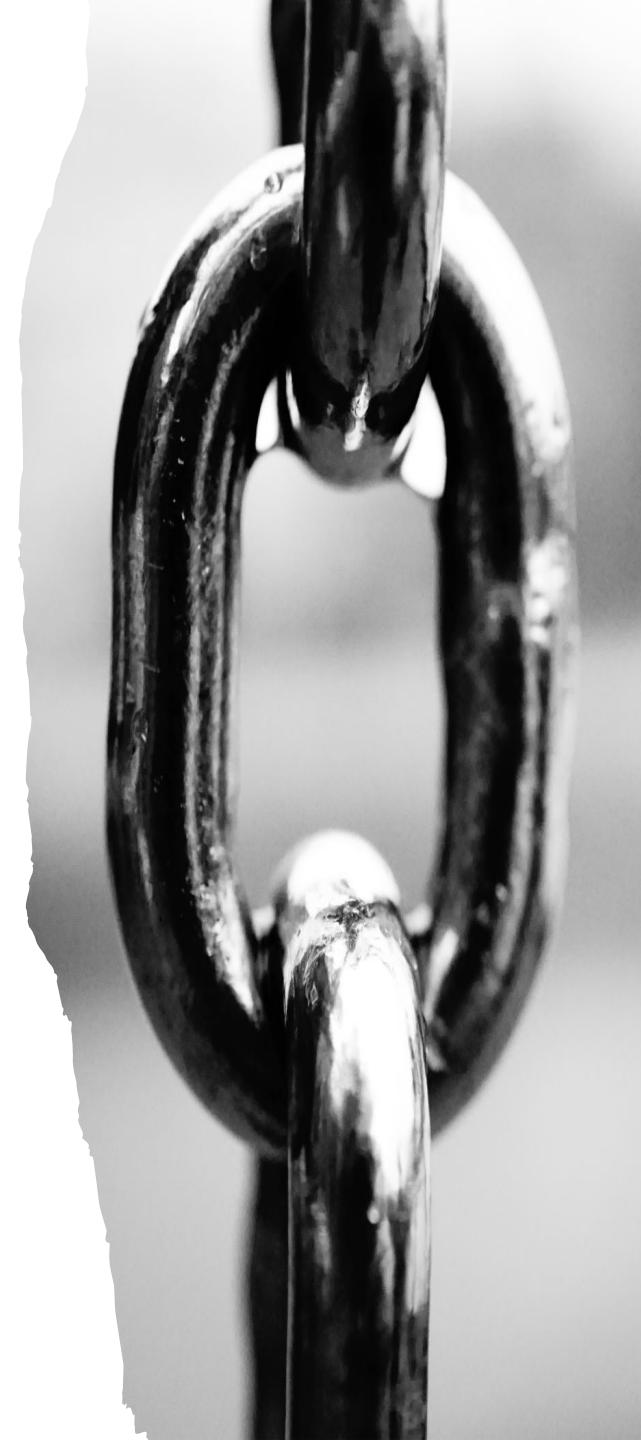
## Agenda

- Why Hunger Chain?
- Learning objectives
- Teaching plan
- Feedback
- Let's play



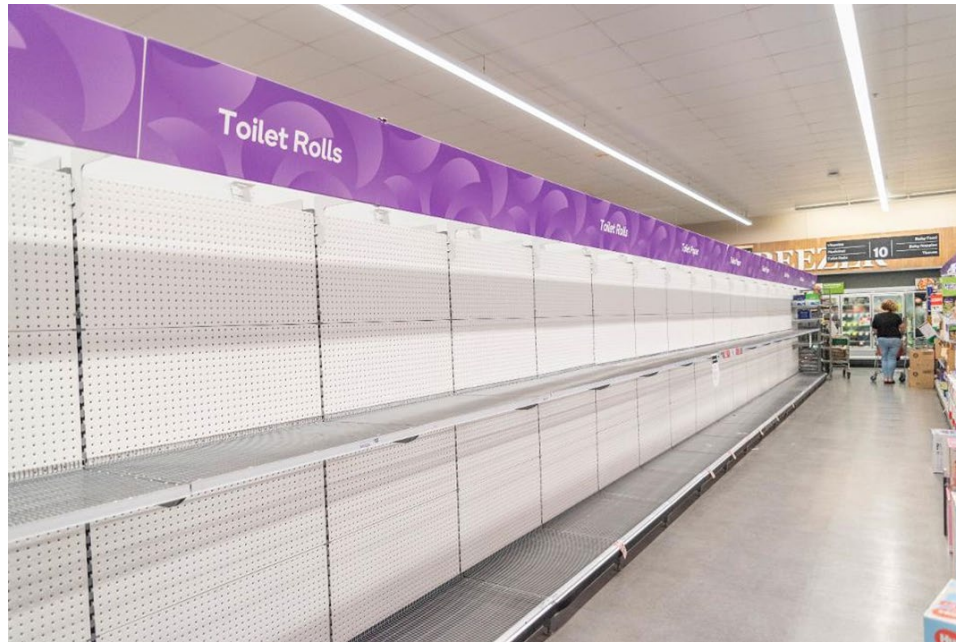
Mummy bird only has one worm, whom to give it to?

# **Why Hunger Chain?**





# Severe COVID-19 Shortage

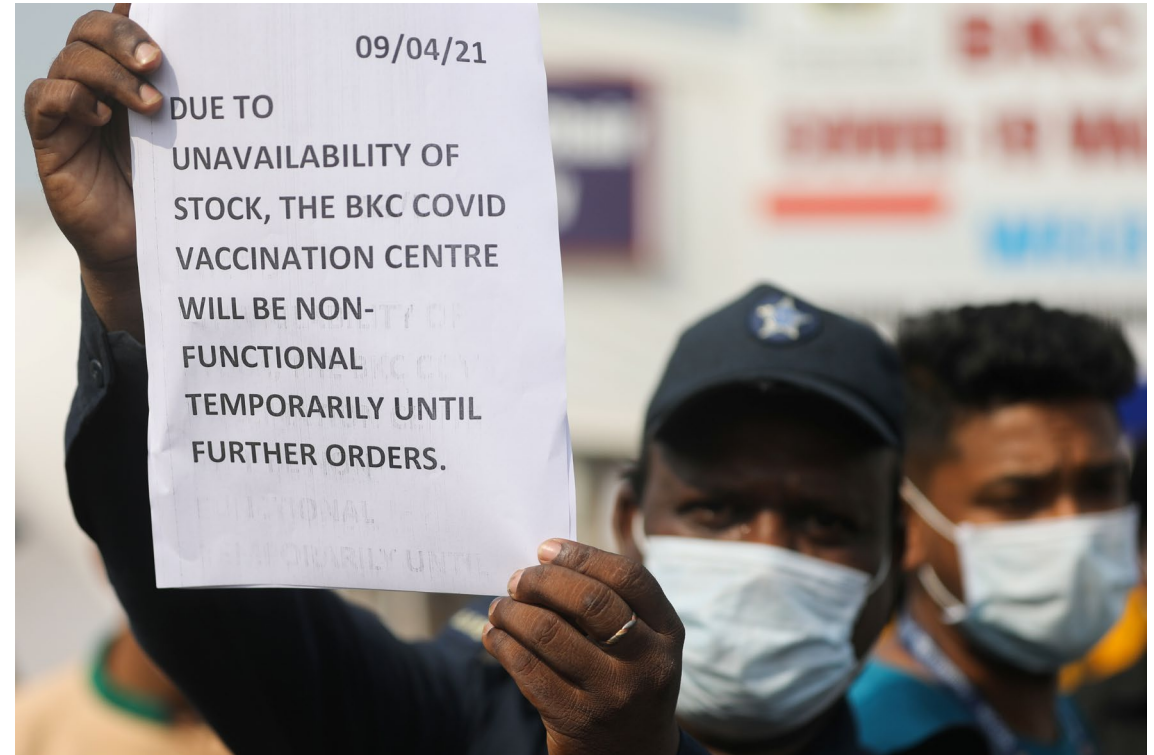


Panic orders



Hoarding

## Waste Despite Shortage



Millions of Covid-19 vaccine doses were wasted even as shortages plague other parts of the world\*

\*The Guardian, 2021, Oct 16.

## Teaching Challenges

- Hard to lecture Shortage Gaming, Competition, Prisoner's Dilemma, but easy to play out.
- Students are easily distracted but can be engaged in games.





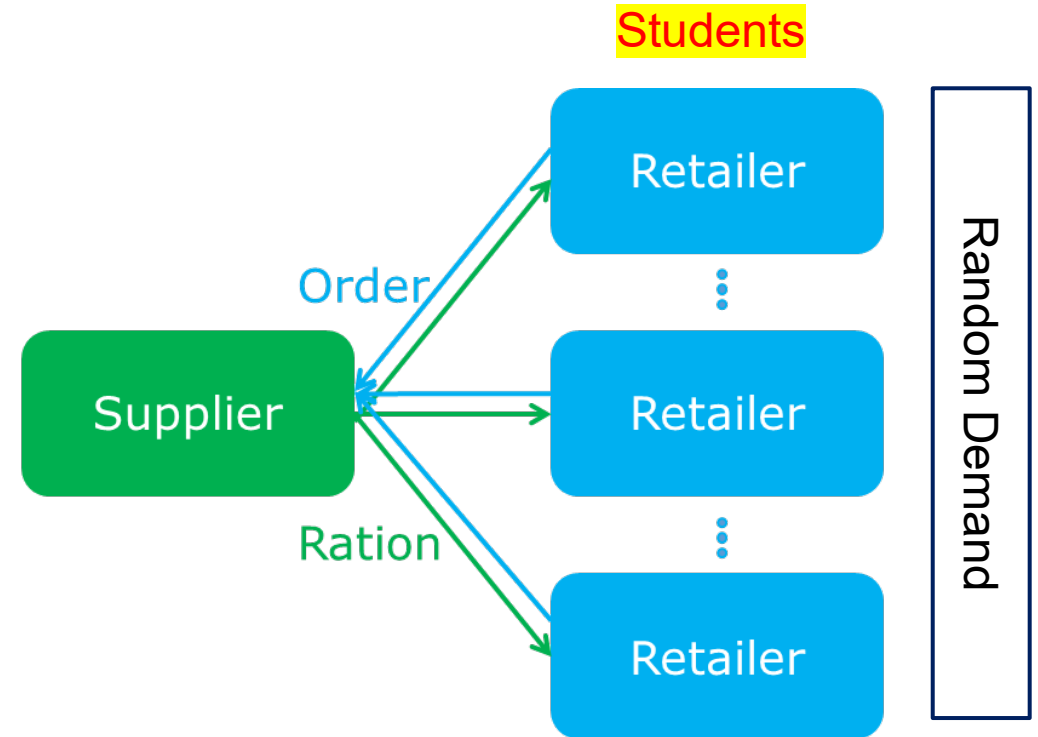
# Learning Objectives



# Shortage Gaming (Panic Order, Hoarding), Competition, Rationing



Mummy bird only has one worm, whom to give it to?



Supply is limited, how to allocate efficiently and fairly?

# Supply Chain Under Shortage might suffer...

**Panic Orders**



**Hoarding**



**Wrong Allocation**



## A Competitive Environment

Multiple Retailers



Retailer 1

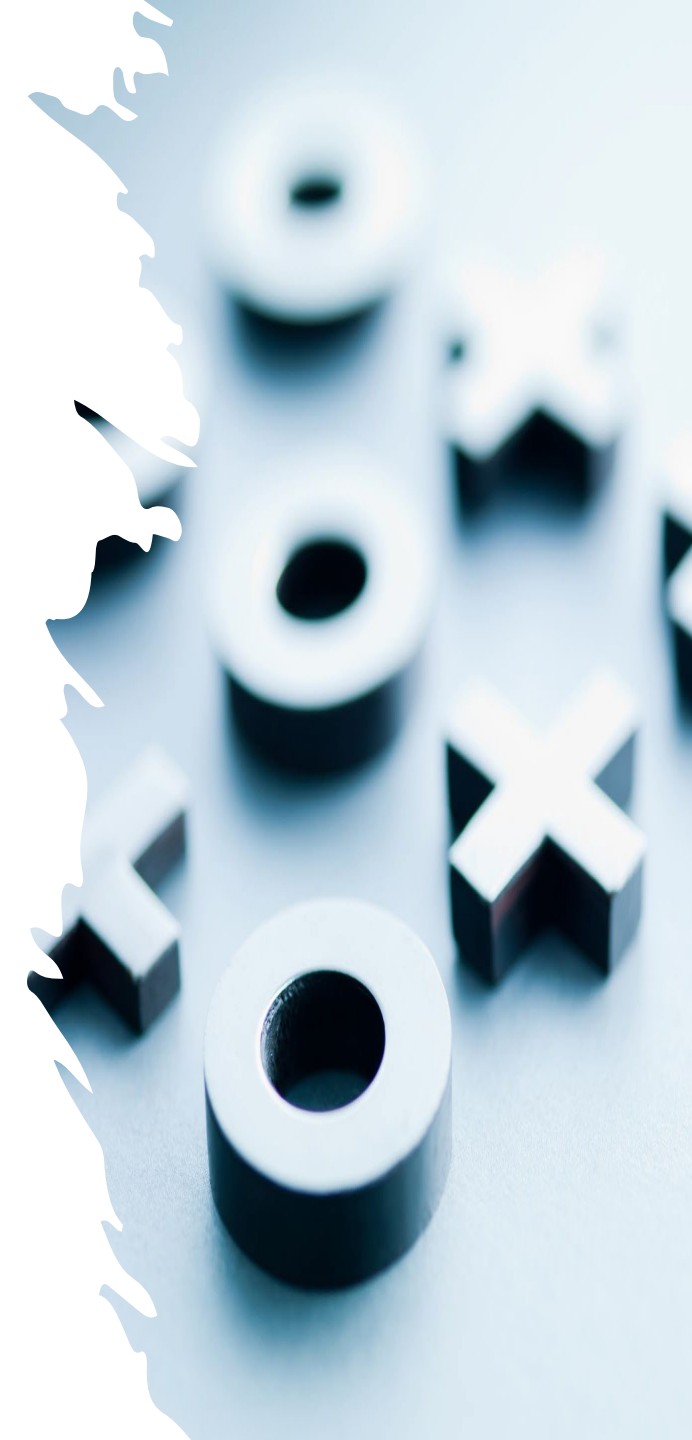
Compete for a  
limited supply

Hunger chain is

**interactive** &  
**competitive**

in the sense that  
one team's action  
affects others'  
payoff.

# Teaching Plan

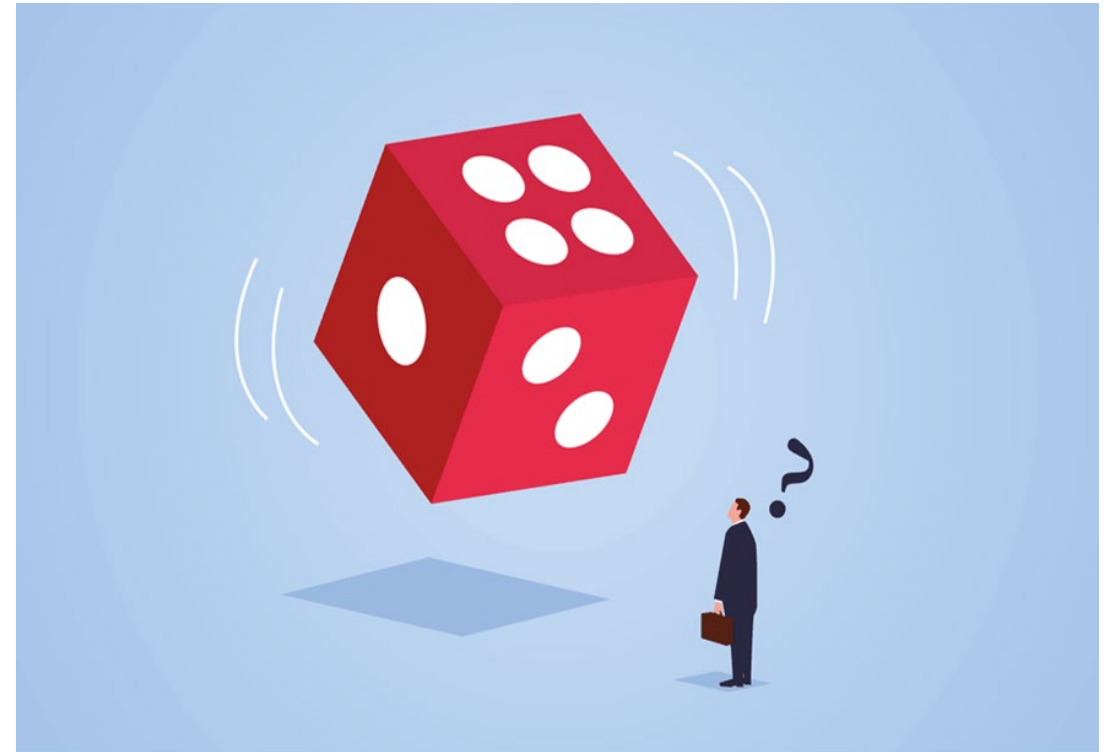




## Teaching Plan (45 mins ~ 3 Hours)



The Shortage Game



The Newsvendor Game

## Sample Teaching Plan

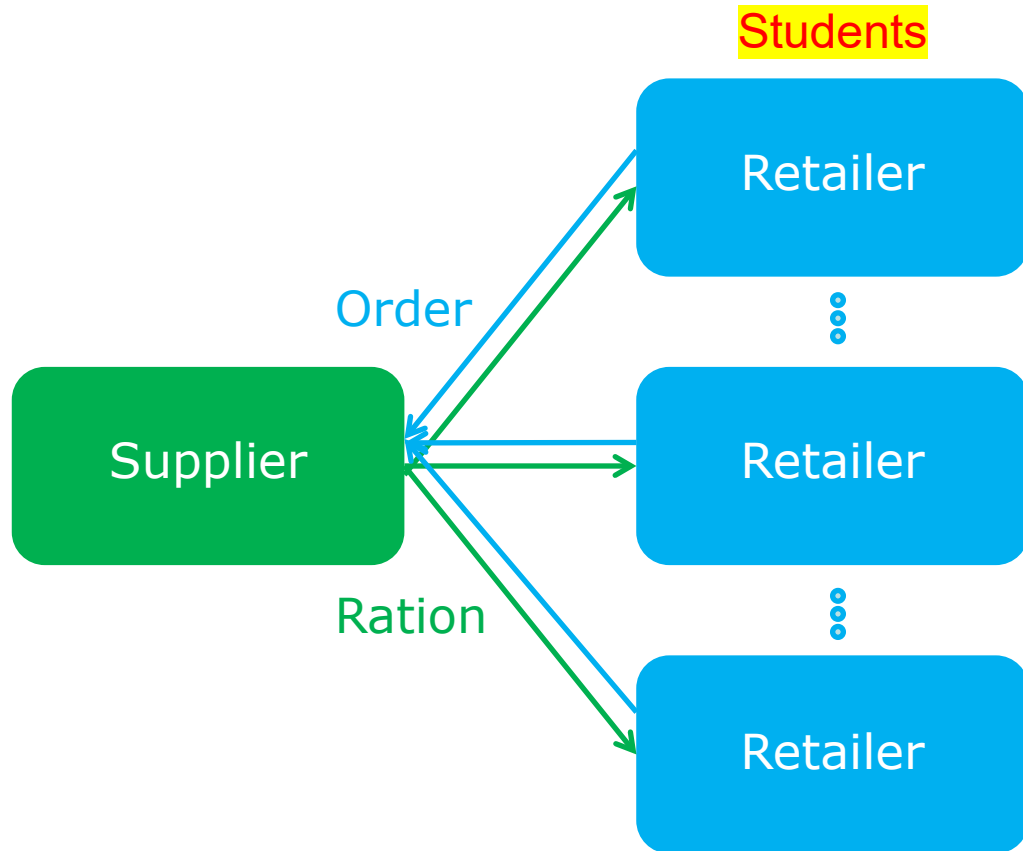
### 1. The newsvendor game

- Students trial and error w/o knowing the newsvendor model
- Learn the magic number – newsvendor solution
- Relate to game experience

### 2. The shortage game

- Panic orders, hoarding, Prisoners' Dilemma, supply chain melt down
- Relate to real life practices
- Supply rationing: the fair sharing rule (“turn-and-earn”\*)

# The Hunger Chain



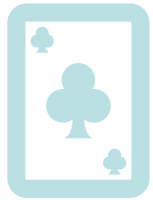
- Retailers (students) place orders; supplier (robot) decides allocation

- **Proportional Allocation Rule**

If total order > total supply

$$\mathbf{Ration} = \frac{\textit{The retailer's order}}{\textit{Sum of all retailers' orders}} \times \textit{Supply}$$

# **Rounds 1 ~ 3, Without Revealing Competitive Information**



- Students can only see their performance for each period.



**Competition : Your profit depends on others' actions.**



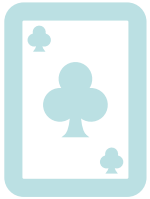
**Must consider your competitors' strategies.**



# Rounds 4 ~ 6,

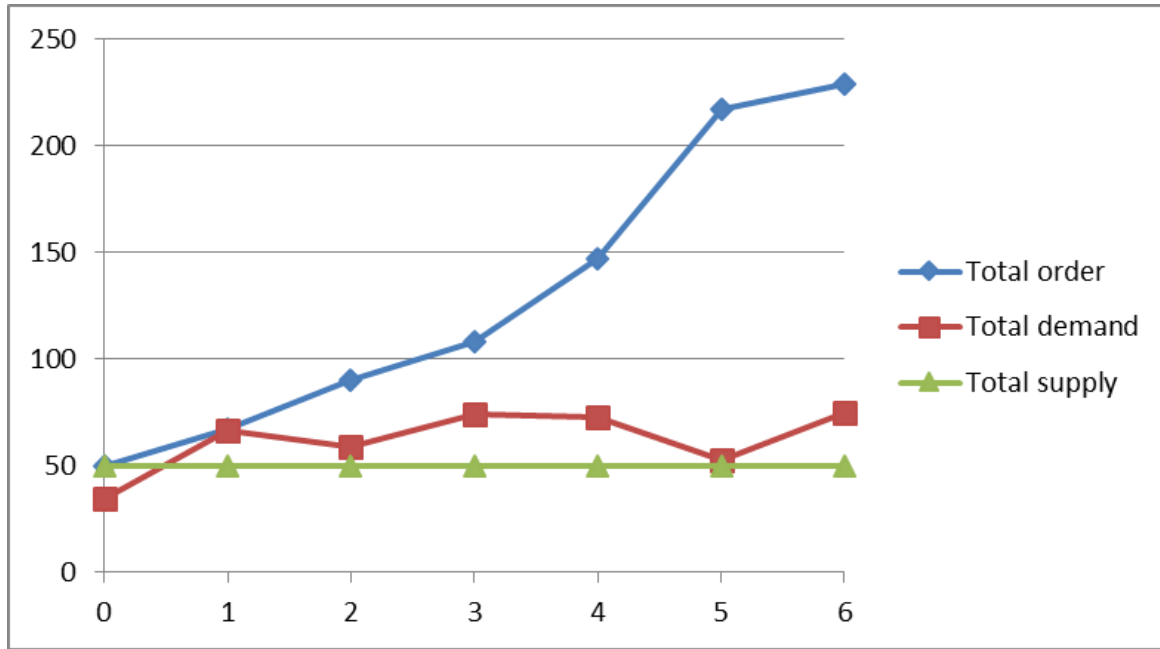
# Revealing Competitive Information

Show Complete Game Info



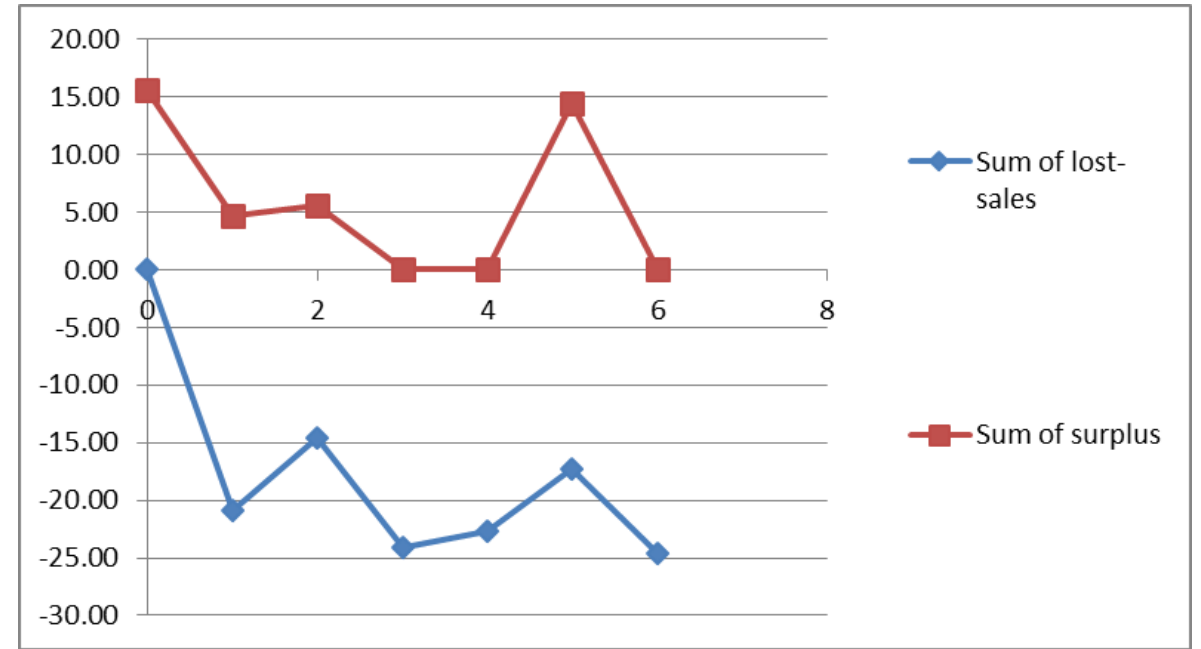
Period	Total Demand	Total Order	Total Supply	Total Lost Sales	Total Surplus Inventory
0	34.36	40.00	40.00	0.00	5.64
1	57.97	132.00	40.00	20.57	2.60
2	74.06	200.00	40.00	34.06	0.00
3	62.67	485.00	40.00	22.95	0.29
4	57.10	1650.00	40.00	17.31	0.21
5	61.46	5750.00	40.00	24.41	2.94
6	67.86	225000.00	40.00	57.23	29.38

# Sample Game Trajectory



Facing stable demand, total order increases significantly over time!

Panic orders



Both lost-sales and surplus inventory in the same time!

Hoarding

# Is Order Inflation Inevitable?

<b>Retailer 1</b>		↑		
Tell truth	1: Lose badly 2: Win more	1: Win 2: Win		
	1: Lose less 2: Lose less	1: Win more 2: Lose badly		
Inflate order				
	Inflate order	Tell truth	<b>Retailer 2</b>	

The Prisoners' Dilemma



- Real life examples?



**How to handle shortage?**



## Suggest a Solution at the End...

- **Fair sharing\***: uses past sales to allocate supply
  - Ex: Allocates limited supply among customers by their %s of the last 13-week of shipments
  - If Store contributed to 10% of the total sales in the previous 13-week period, then allocate 10% of the supply to Store.

### Pros:

- No Order = No Game
- Promotes sales, clear incentives.
- Guarantees product delivery to high-demand markets.

### Cons:

- Might lock in market shares – unfair
- Disregard retailers' forecast and marketing effort

\*Lu and Lariviere (2011)

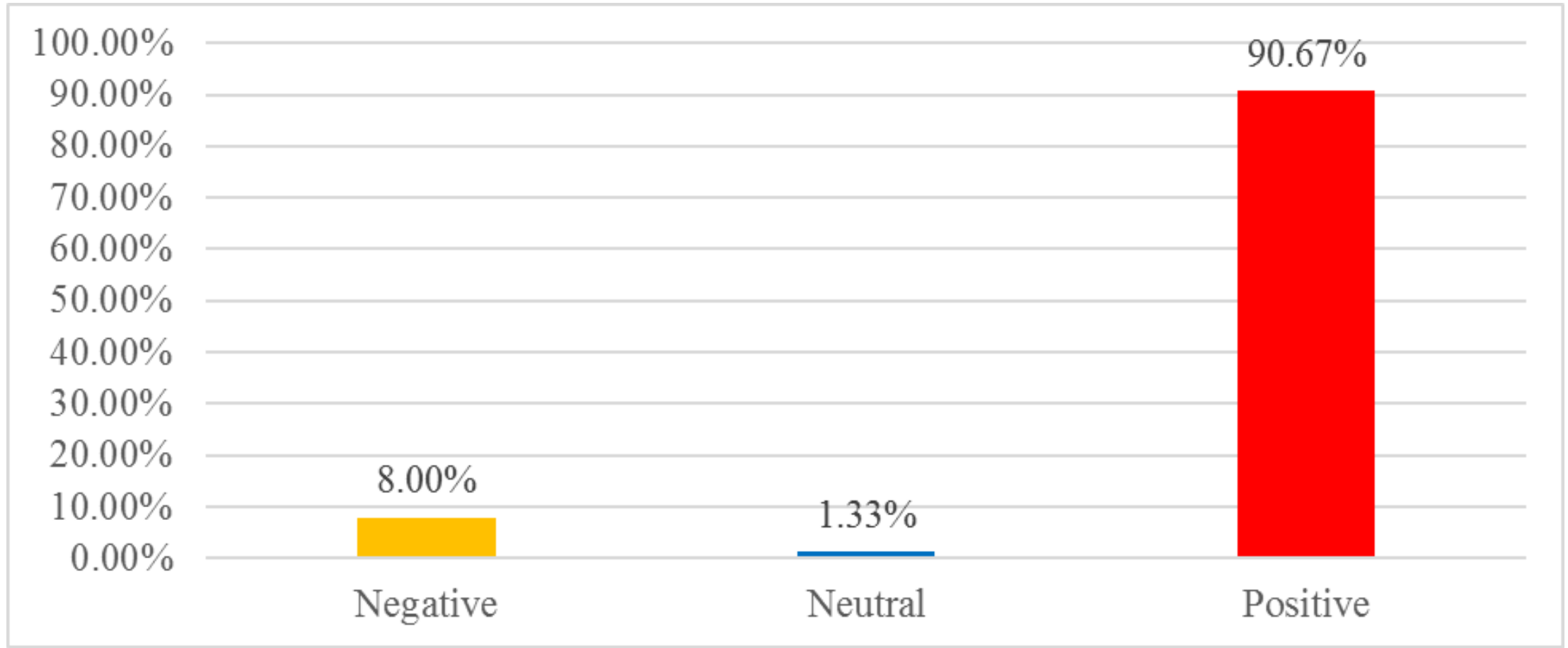
# Feedback





- **Courses and audience**
  - **Courses**: Operations Management (Analysis), Supply Chain Mgmt., Procurement / Sourcing, Distribution & Logistics.
  - **Target audience**: Undergraduate, Graduate (MS, MBA), Executive / Continuing Education Students.
- **Games stats**: 80+ instructors, ~2000 student teams, 600+ games
- **Awards**: 2021 Decision Sciences Journal of Innovative Education (DSJIE) Best Teaching Brief awards, Finalist – 2019 DSI Instructional Innovation Award.

## Sentiment Analysis of Student Feedback



Decision Science Journal of Innovative Education Paper:

[https://yzhao12345.github.io/assets/doc/Song\\_Park\\_Zhao\\_DSJIE21.pdf](https://yzhao12345.github.io/assets/doc/Song_Park_Zhao_DSJIE21.pdf)



# Sample Student / Instructor Feedback

- A student: “The Hunger Game was very **interactive** and brought critical thinking to the activity. I really enjoyed it as we got to work in groups while being inclusive enough to work together as a class. **The competition** aspect of the activity pushes each group to become more **proactive with critical thinking** which broadens everyone's perspective and **reflection of real-world competition.**”
- An instructor: “The game successfully boosted **student engagement** in my online class, which helps me to achieve **4.51 [out of 5]** rating in my summer teaching evaluation.”

# Sample Test Questions / Test Scores

Questions	Learning Objective	Experimental Group (Played the simulation, n =13)		Control Group (Did not play the simulation, n =16)		Mann-Whitney U test <i>p</i> -values
		Mean	SD	Mean	SD	
Q1: Why could shortage of supply lead to panic orders or hoarding?	Understand the causes of the <b>panic orders &amp; hoarding</b> under supply shortages.	<b>7.96</b>	1.11	<b>6.25</b>	1.22	0.026
Q2: How the retailer's outcome depend on the actions of others?	<b>Hands-on experience of supply chain competition.</b>	<b>8.03</b>	1.03	<b>5.80</b>	0.70	0.003
Q3. Which allocation rule that you learned allocates more efficiently and/or fairly? Why?	Understand the importance of <b>supply rationing</b> rules in terms of efficiency and fairness.	<b>8.00</b>	1.11	<b>6.63</b>	1.25	0.037

# Recap

- **Easy to Setup**: Online gaming only needs a browser.
- Hard-to-lecture but easy to play out, offers practical insights through “**Hands-on Experiences**”.
- A valuable tool for teaching **important and contemporary SCM topics**: shortage gaming, supply chain competition and rationing, particularly following COVID-19 pandemic.



# YouTube Videos for Detailed Teaching Notes

## Agenda

1. Introduction
2. How to play the game?
3. Games
  - Newsvendor game
  - Shortage game
4. Discussion and extension



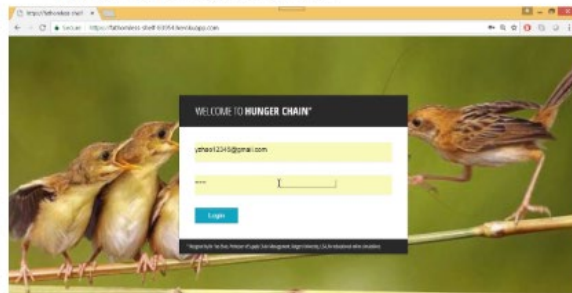
## Hunger Chain Simulation - Introduction

youtu.be

An introduction to Hunger Chain - A Competitive Supply Chain Simulation

<https://youtu.be/tHCXs51Ba-E>

## Students Receive Results



## Hunger Chain Simulation - How to play

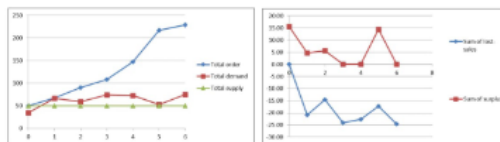
youtu.be

Use an example to show how to play the Hunger Chain Simulation

[https://youtu.be/BloIth\\_6duk](https://youtu.be/BloIth_6duk)

## Game Trajectory

This is just an example, please plot **your** game data (competitive information table) in Excel.



Facing stable demand, why did total order increase significantly over time?

Why do we have both lost-sales and surplus inventory in the same time?

## Hunger Chain Simulation - Gaming and Discussion

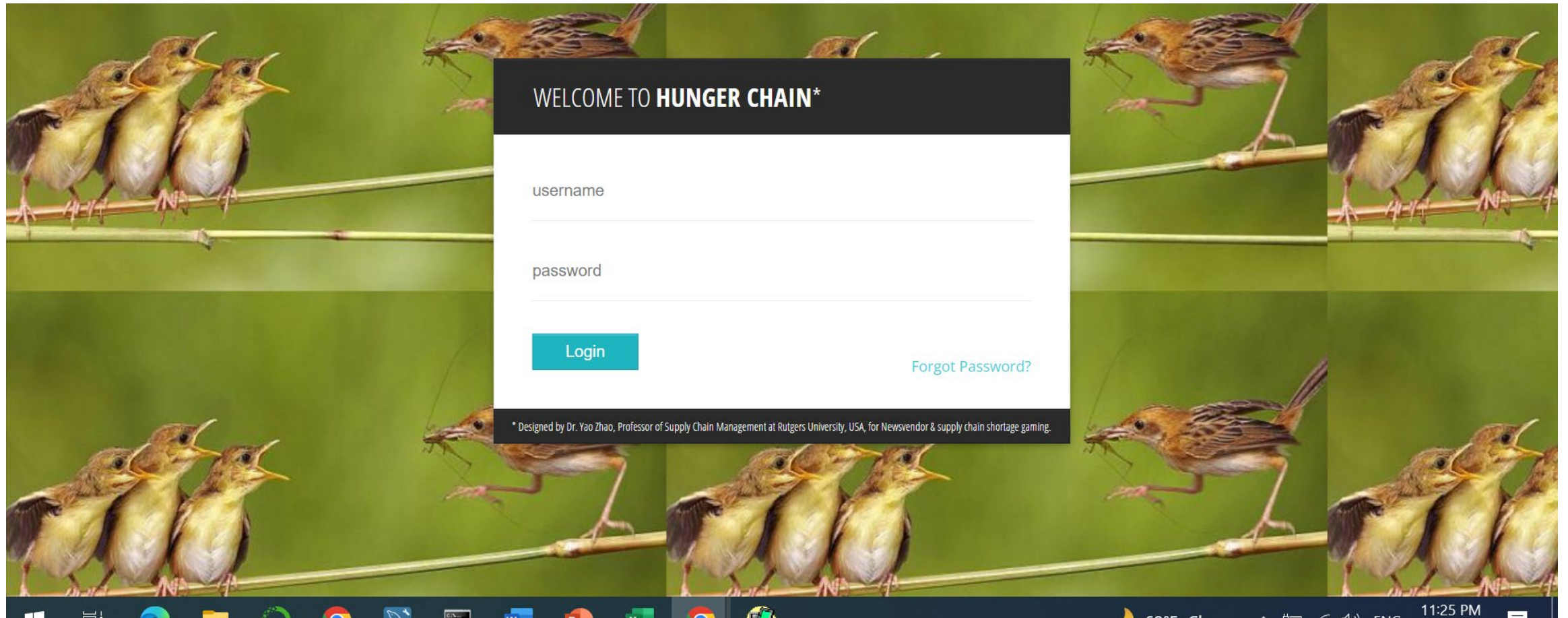
youtu.be

Teaching note for the Hunger Chain Simulation

<https://youtu.be/WPqK5JwXEy8>

Let's  
PLAY

# Instructor Account (Please email [yaozhao@rutgers.edu](mailto:yaozhao@rutgers.edu))



<https://hunger.gamespots.net/>



# Instructor Game Page: Setup Student Teams

Game Page for yaozhao@business.rutgers.edu

### Game Setup

Number of Groups (Integer):

Number of Rounds (Integer):

Player E-mails (To send login credentials to students. **seperated by ';**. Example: andy@yahoo.com;bill@gmail.com. Check spam or trash if not received):

Demand Distribution:

Demand Synchronization:

Supply per Player (default = 12.5, mean demand = 15):

Sale Price (default = \$10):

Cost (default = \$2):

Maximum Order:

### Game Controls

Windows taskbar: 6:40 PM 10/12/2022

Callouts:

- Number of student teams
- Number of periods
- One email for each team (separated by ;)
- Teams will receive a password via this email once instructor starts game.

# Instructor Game Page: Set Game Parameters

Game Page for yaozhao@business.rutgers.edu

### Game Setup

Number of Groups (Integer):

Number of Rounds (Integer):

Player E-mails (To send login credentials to students. **seperated by ';'.** Example: andy@yahoo.com;bill@gmail.com. Check spam or trash if not received):

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Supply per Player (default = 12.5, mean demand = 15):

Sale Price (default = \$10):

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Maximum Order:

### Game Controls

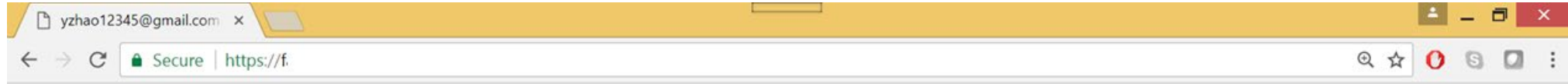
Windows taskbar icons: Internet Explorer, Firefox, Chrome, Edge, File Explorer, Task Manager, etc.

Select demand distribution.

Select either asynchronized or synchronized demand for retailers.

- The total supply = Supply per Player \* Number of Groups
- Mean demand = 15; if Supply per Player < 15, shortage game; if >>, newsvendor game.

# Students Game Page



## yzhao12345@gmail.com Game Page

Logout

### Current Game (Refresh the Page If Necessary)

Period	Demand	Order	Ration	Sales	Lost Sales	Surplus Inventory	Profit	Cumulative Profit
0	8.59	12.5	12.5	8.59	0.00	3.91	60.90	60.90
1								

Submit

### Previous Games

Show Game List

Student team types in order, then clicks Submit

The team only sees its own results but not the results of the competing teams



**For more information**  
**[yzhao12345.github.io](https://yzhao12345.github.io)**