

# The Pulley and the Pendulum: Thinking Maps for ESOL Science

Marjorie Cooper

[marjoriecooper@globalvillageproject.org](mailto:marjoriecooper@globalvillageproject.org)

Mary Lou McCloskey

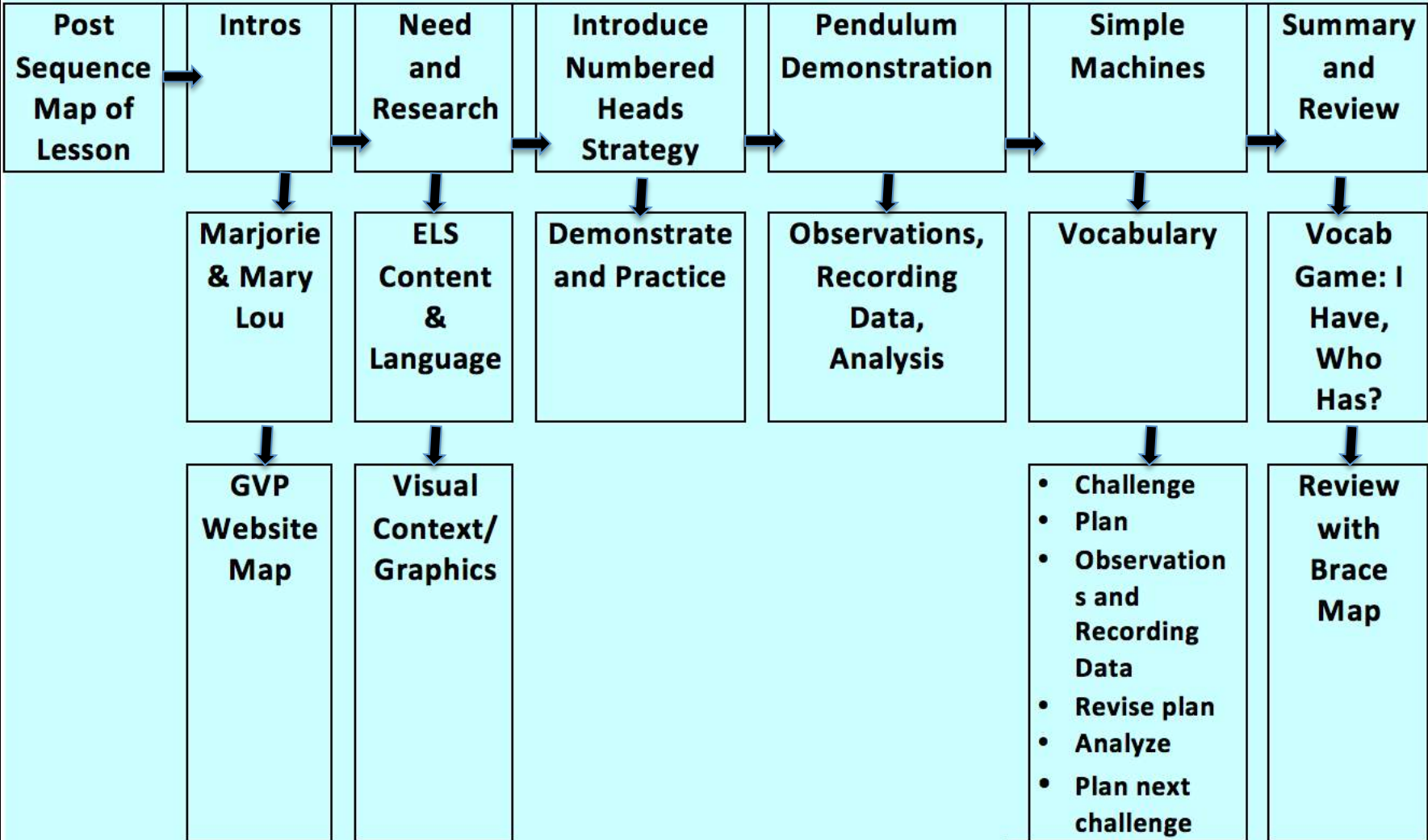
[ml@mlmcc.com](mailto:ml@mlmcc.com)

The Global Village Project

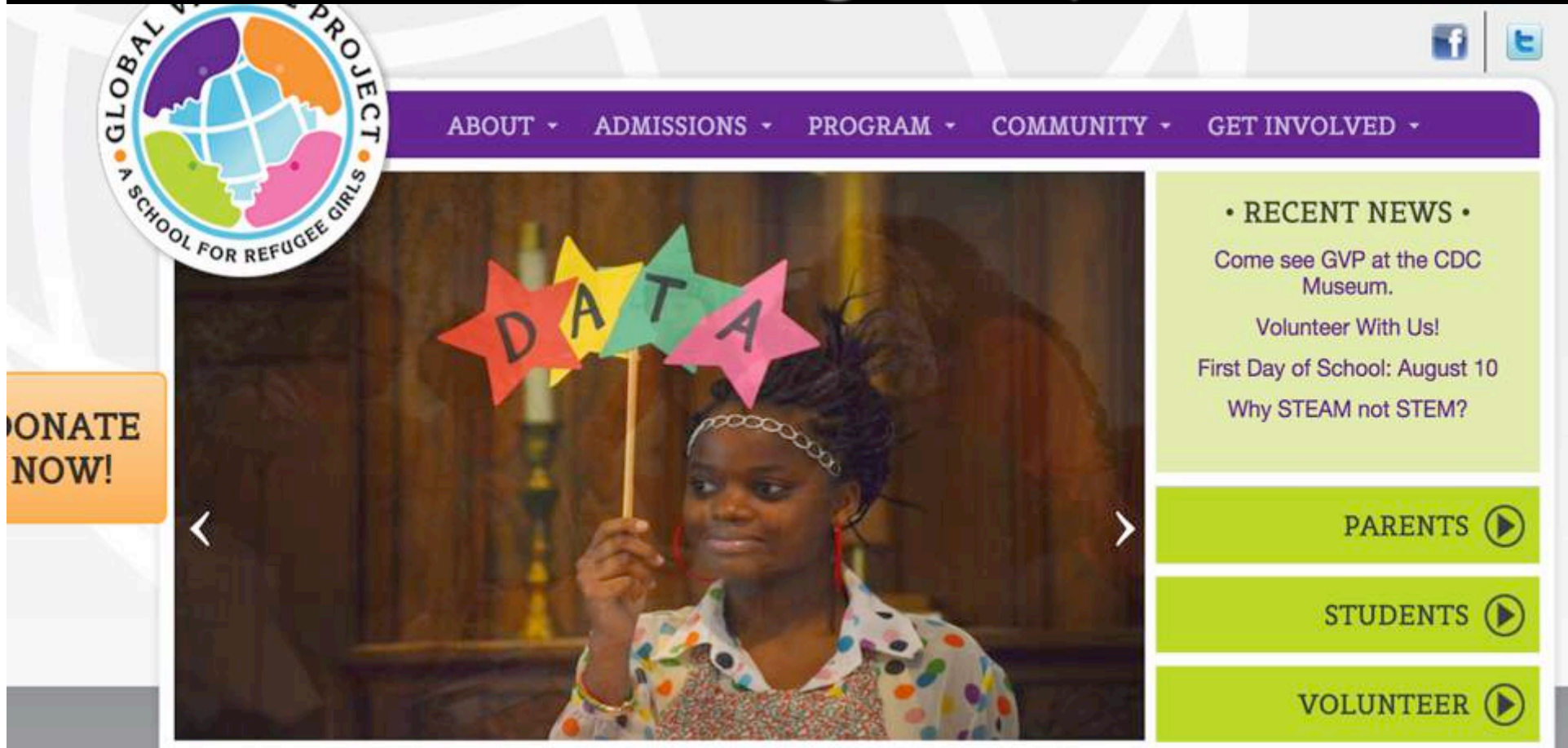
[www.globalvillageproject.org](http://www.globalvillageproject.org)

Handouts: [www.mlmcc.com](http://www.mlmcc.com)

## Flow Chart of Session Sequence



# The Global Village Project



The screenshot shows the homepage of the Global Village Project website. At the top left is the organization's logo, a circular emblem with a globe and the text "GLOBAL VILLAGE PROJECT" and "A SCHOOL FOR REFUGEE GIRLS". To the right of the logo is a purple navigation bar with links for "ABOUT", "ADMISSIONS", "PROGRAM", "COMMUNITY", and "GET INVOLVED". In the top right corner are social media icons for Facebook and Twitter. The main content area features a large video player showing a young girl holding a sign that says "DATA". To the left of the video is an orange button that says "DONATE NOW!". To the right of the video is a green sidebar with a "RECENT NEWS" section containing text about a CDC Museum event and a "First Day of School" announcement. Below the news are three green buttons labeled "PARENTS", "STUDENTS", and "VOLUNTEER", each with a play icon.

GLOBAL VILLAGE PROJECT  
A SCHOOL FOR REFUGEE GIRLS

ABOUT ▾ ADMISSIONS ▾ PROGRAM ▾ COMMUNITY ▾ GET INVOLVED ▾

DONATE NOW!

DATA

• RECENT NEWS •

Come see GVP at the CDC Museum.

Volunteer With Us!

First Day of School: August 10

Why STEAM not STEM?

PARENTS ▶

STUDENTS ▶

VOLUNTEER ▶

*Helping Teenage Refugee Girls Achieve Their Educational Dreams...*

[www.globalvillageproject.org](http://www.globalvillageproject.org)

**Who are  
We?**

**We Serve:**

- **Refugee**
  - **Teenage**
  - **Girls**
- with**
- **Interrupted Education**

Afghanistan  
Burma (Chin)  
Burma (Karen)  
Burma (Royhinga)  
Central African  
Republic  
Democratic Republic of  
the Congo  
Eritrea  
Ethiopia  
Iraq  
Nepal  
Rwanda  
Somalia  
*Pass-through  
countries:*  
Thailand  
Uganda  
Kenya

Amharic  
Arabic  
Burmese  
Burmese  
Dari  
English  
French  
Karen  
Kinyarwanda  
Lingala  
Matu Chin  
Nepali  
Pashto  
Portuguese  
Royhinga  
Sango  
Somali  
Swahili  
Tigrinya

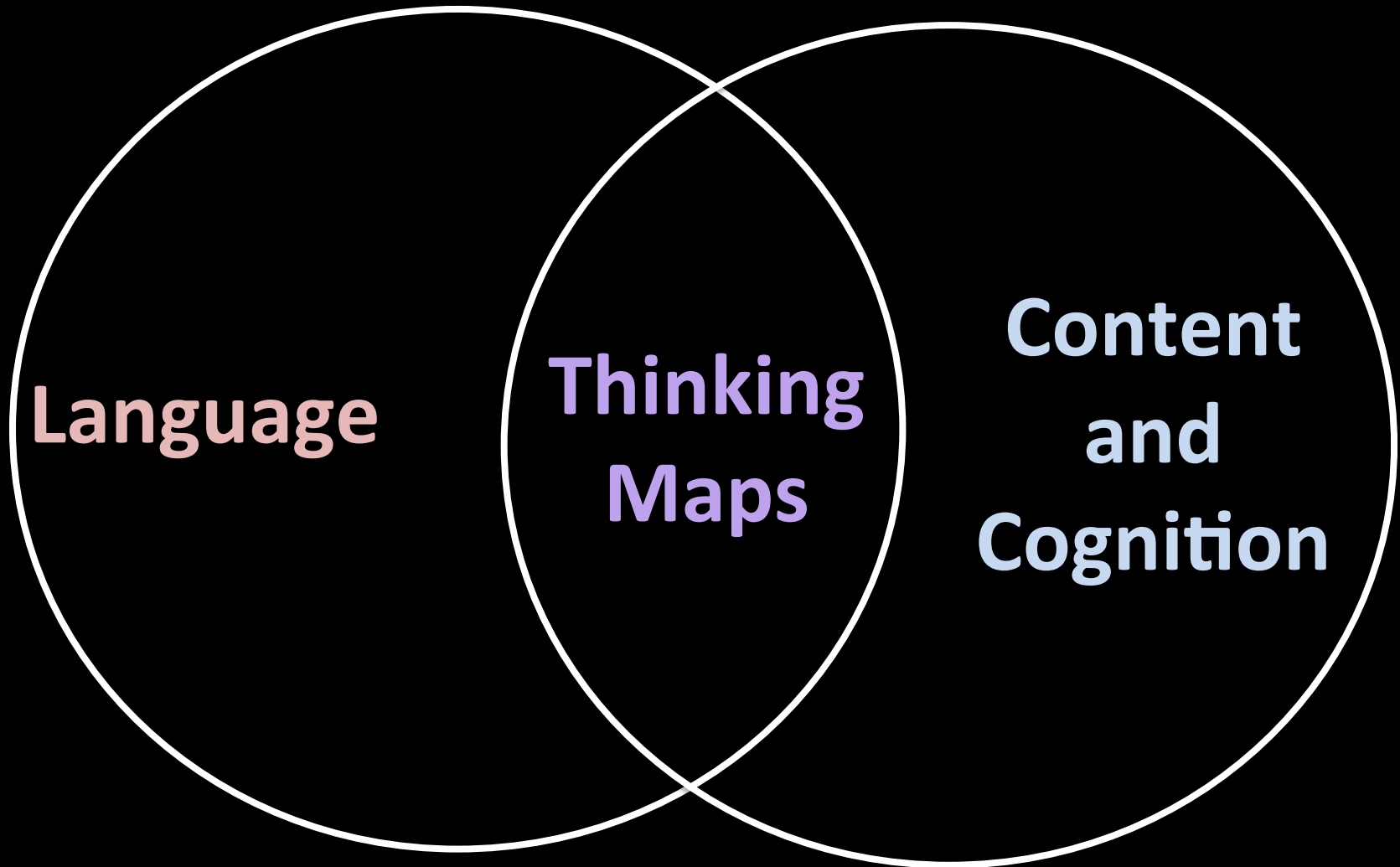
**Students come from 10 countries/cultures  
and speak 19 languages.**

# GVP Program

- English language development
- Guided Reading
- STEAM-based learning
  - Science
  - Technology
  - Engineering
  - Arts
  - Mathematics
- Mentoring
- Community-focus

# Overview :

## Thinking Maps Bridge Language and Content for English Learners



# The Need

- English Learners in science class perform at multiple levels and may have interrupted education.
- They need additional scaffolding to make content accessible and promote cognition
- Visual models positively enhance learning (Tzeng, 2010)
- Graphic organizers like Thinking Maps (Hyerle, 2011) provide schema to provide this scaffolding.
- Maps lend themselves to active, interactive learning environments in which learners take initiative and have responsibility. (Applebee, 1996)



# Integrated Curriculum



How big are the oceans?

Huge, enormous, gigantic!

Southern, Indian, and Arctic,  
Pacific and Atlantic

What makes up the ocean?

Water, Three levels deep

Daylight, Twilight, and Midnight

Full of good things to eat

(1) Who lives in the ocean? Who? Who

Oceans are?  
Why? How? What?  
No?

# Science with Language

- Focus on thinking – Thinking Maps
- Incorporating language objectives
- Integrated with school-wide themes
- GA Middle School Science Content
- Filling in gaps from earlier grades
- Active, Interactive, constructivist learning

# The Challenge

1. Design a ramp (inclined plane).
2. Run the car (wheel and axle) down the ramp to hit a target.
3. Modify your ramp as needed.
4. Record your attempts.

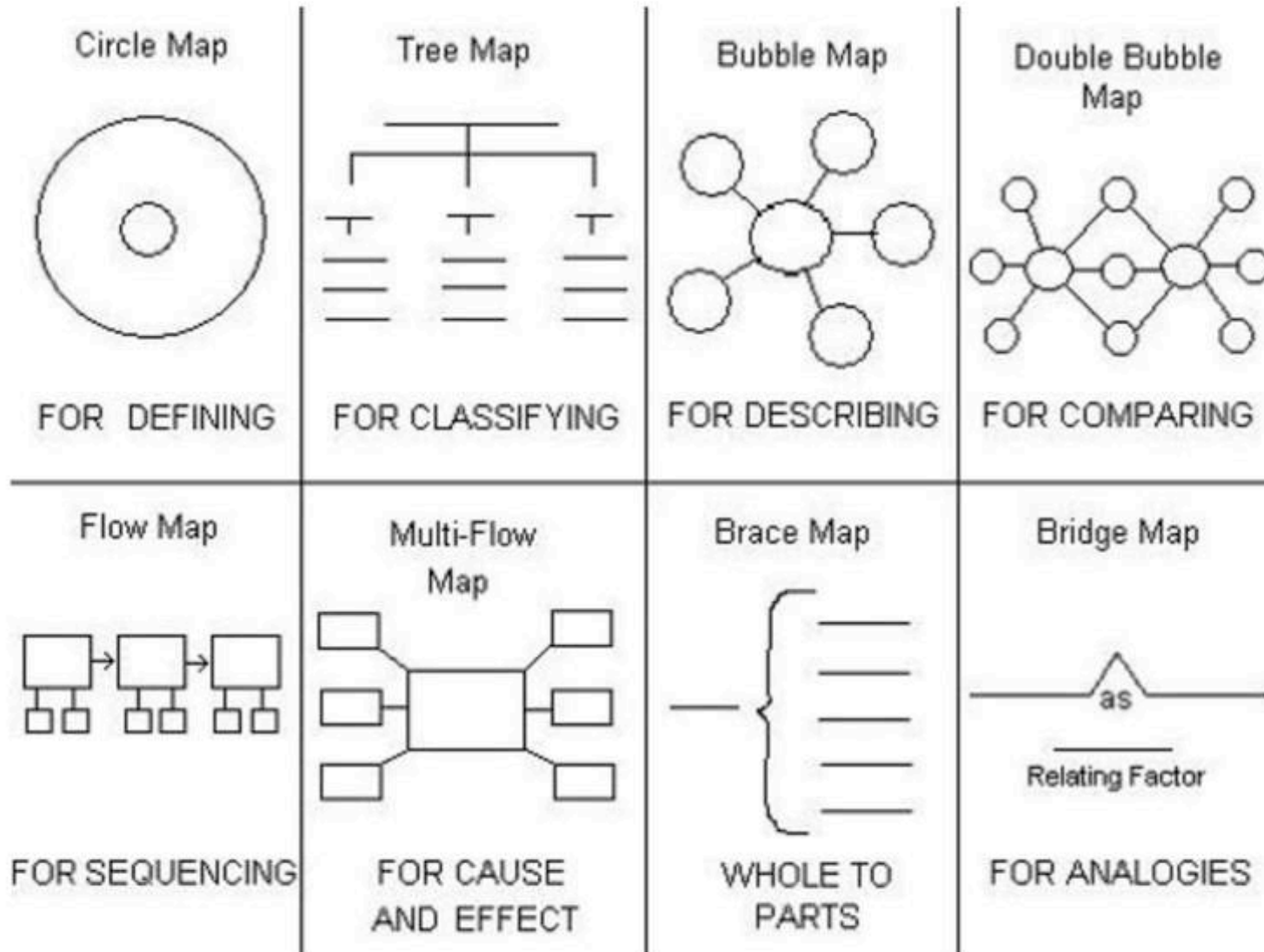
**Goal: Hit the target with your car three times in a row.**

# Engineering

- Dedicated STEAM Class
- Collaborative instruction with math and science teachers.
- Hands-on, integrated experiences in discovering and inventing. Example: Simple Machines with Thinking Maps

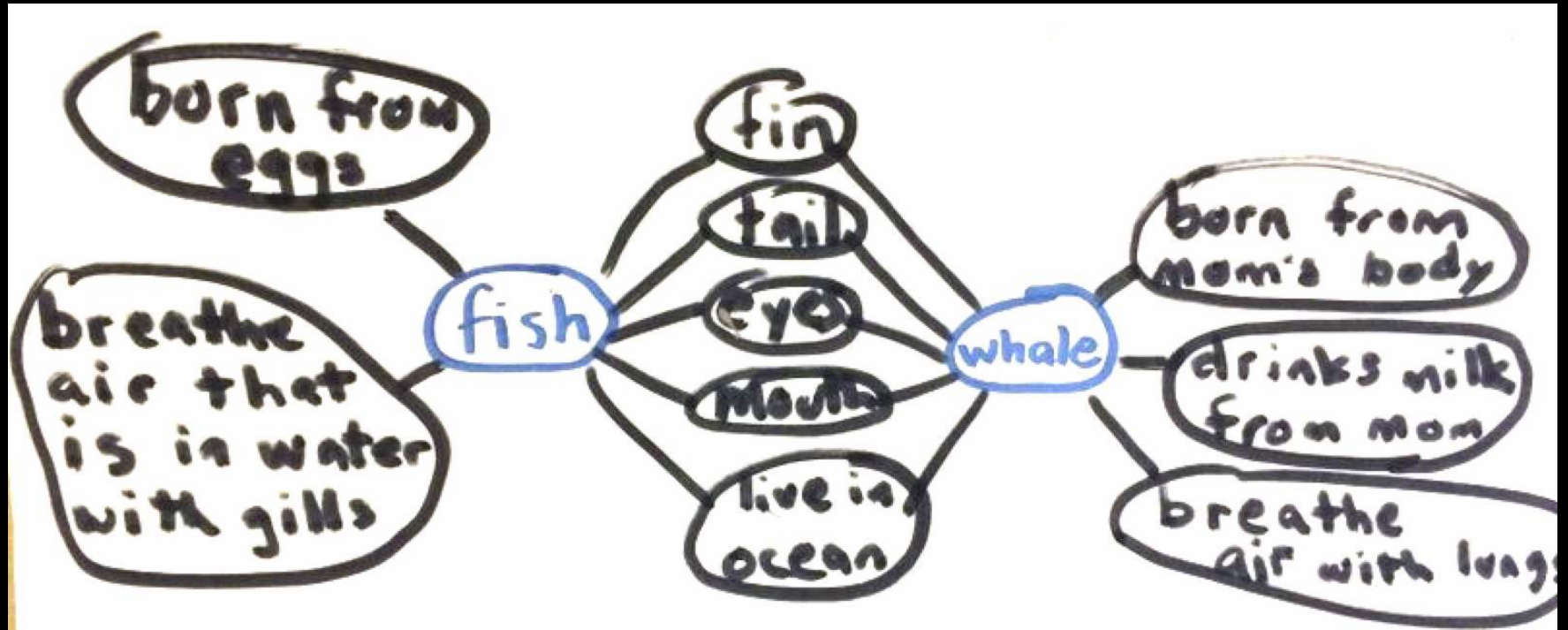
# Thinking Maps in the Science Classroom

# 8 Basic Thinking Maps



# Double-Bubble Thinking Map

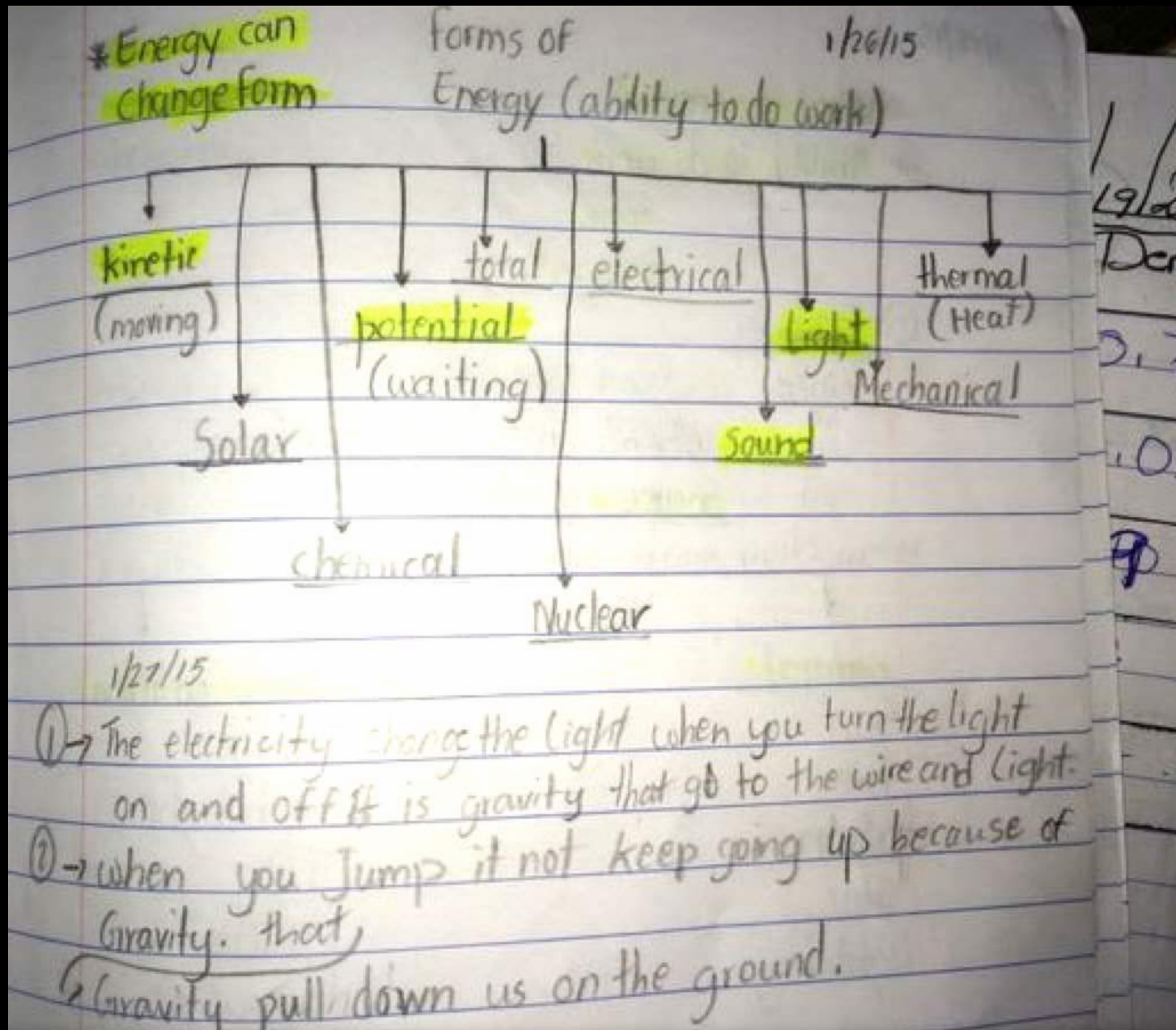
## Comparing and Contrasting Fish and Whale



Form 1 - Science -

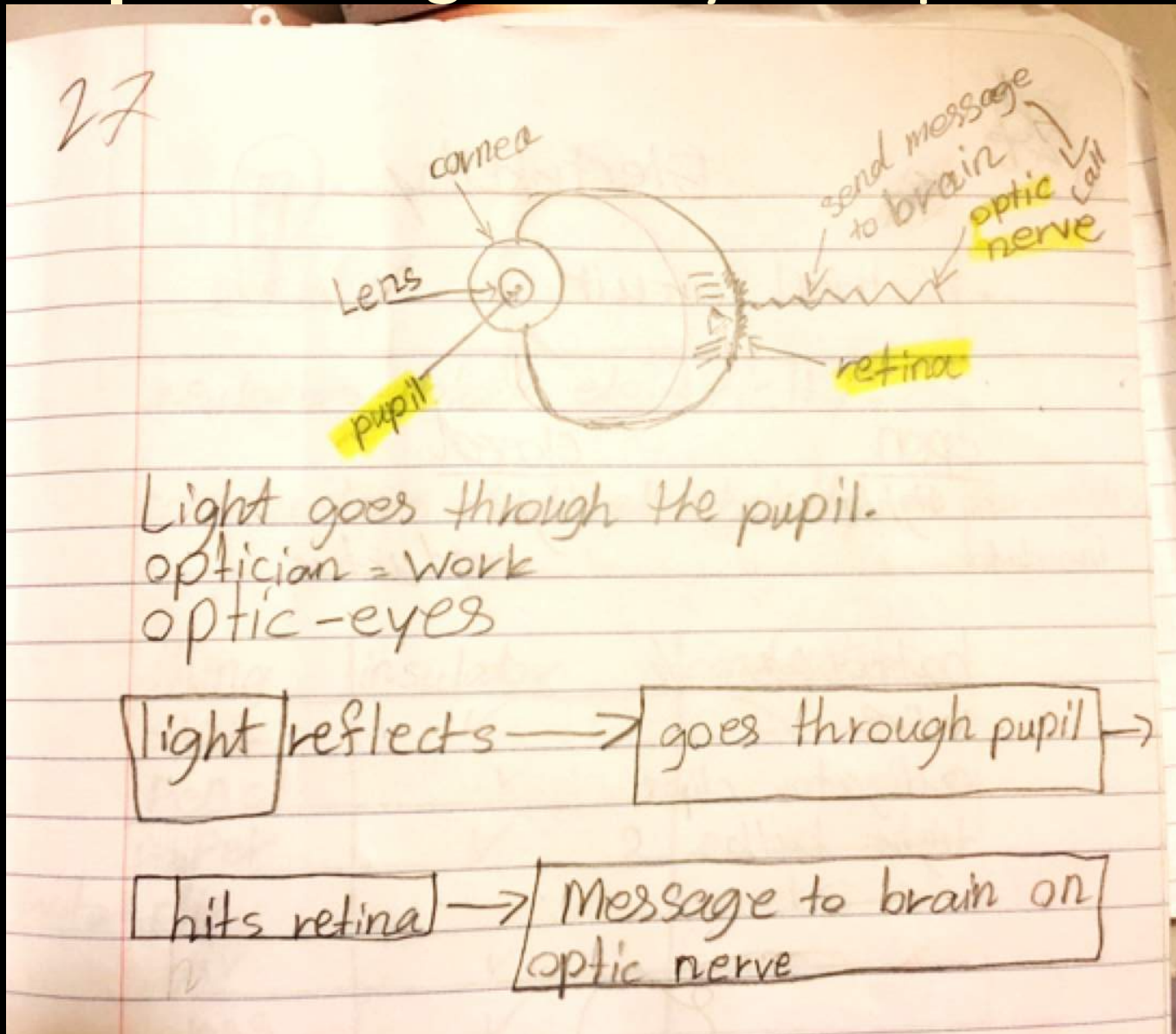
9/15/14

# Tree Map Classifying Forms of Energy



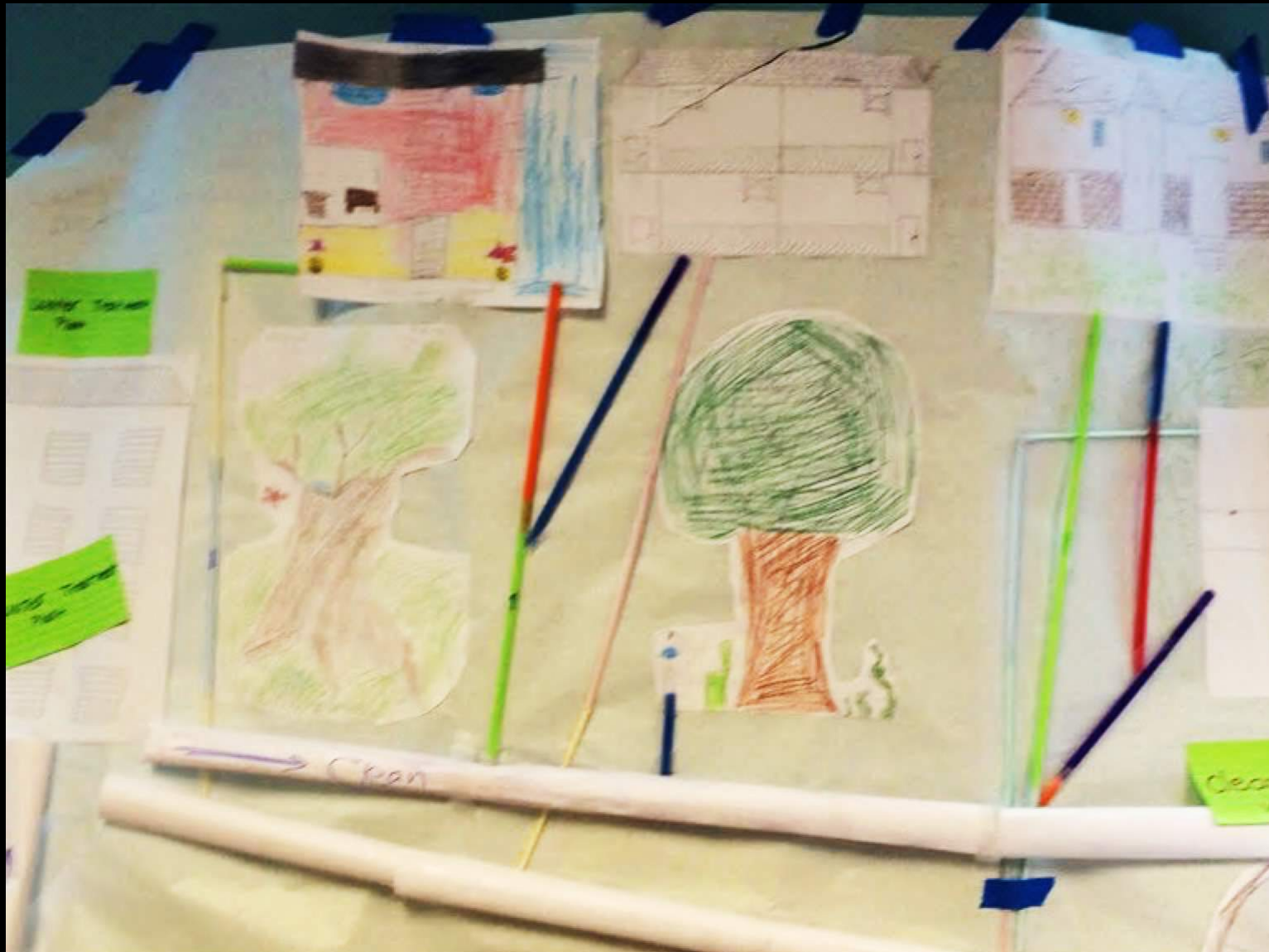


# Diagram Describing the Eye, and Flow Map Showing How Eye Responds to Light



Brace Map  
Showing Parts  
of a Science  
Book about  
Energy

# Flow Map Showing Sequencing (River Water to Purified water. )



# Thinking Maps in the Science Classroom: Video

# Pendulum Demonstration

- Demo with pendulum
  - Observe and count the number of times the pendulum swings.
- Discuss:
  - What happened?
  - Why?
- Introduce terms with cards: push, pull, force, friction, gravity

# Pendulum Lesson

**Vocabulary  
introduced:**

**Push**

**Pull**

**Force**

**Motion**

**Energy**

**Friction**

**Gravity**

**Potential**

**Kenetic**

# Pendulum Demonstration

# Heads Together

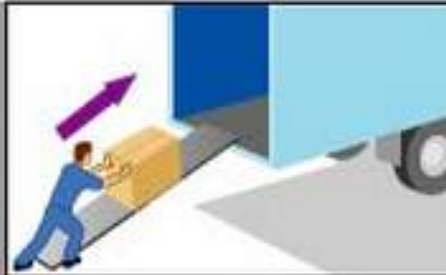
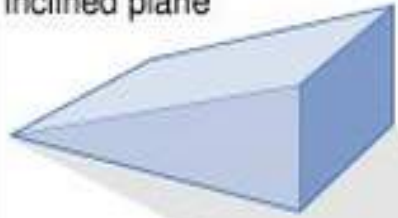


1. Groups of about 4 number off.
2. T presents question/challenge.
3. Groups put heads together to find the answer.
4. T calls out a number; group members with that number answer the question.
5. T gives feedback, points, and asks again.

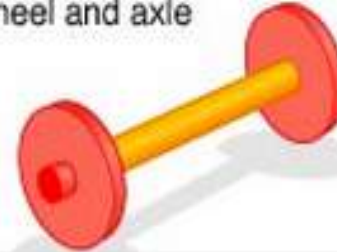


# The Six Simple Machines and Examples

inclined plane



wheel and axle



wedge



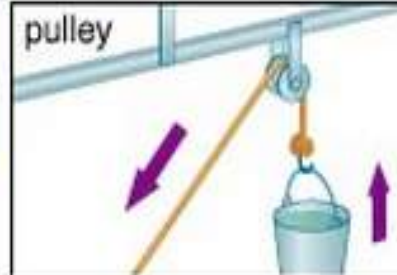
screw



lever



pulley



# Find the Simple Machines: Instructions

1. In your group, put your heads together.
2. Look carefully at the image on the next slide.
3. Find examples of the six simple machines and write them on your chart
4. Make sure all group members are prepared to give your group's answer.

## Machine

## Examples

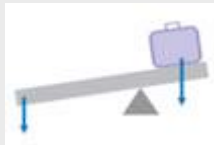
Inclined plane



Wedge



Lever



Wheel and Axle



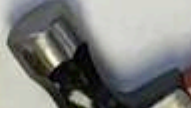
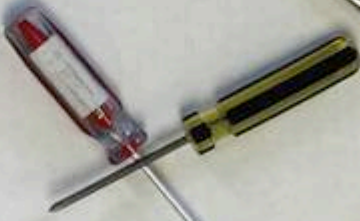
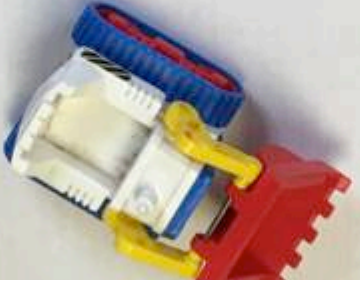
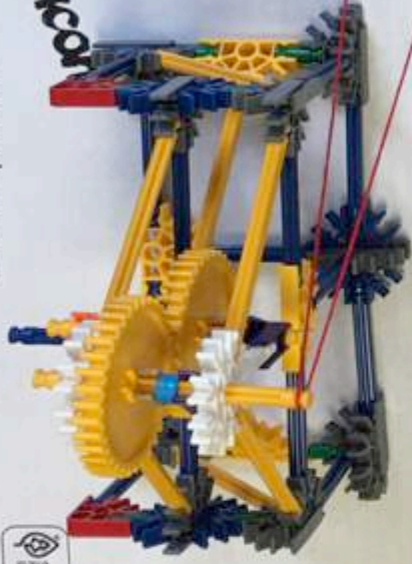
Screw

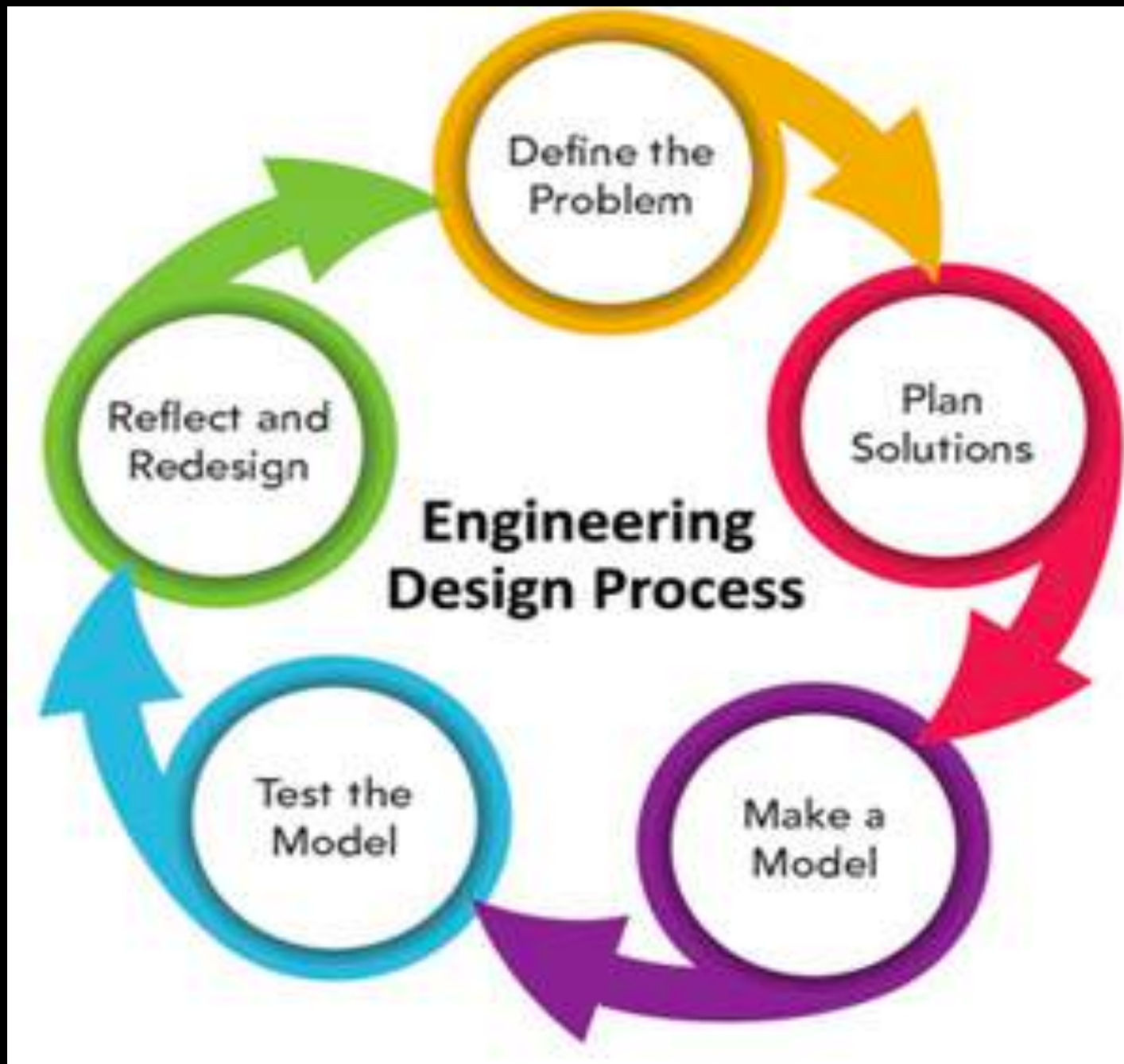


Pulley



Pracov





# The Challenge

1. Design a ramp (inclined plane).
2. Run the car (wheel and axle) down the ramp to hit a target.
3. Modify your ramp as needed.
4. Record your attempts.

**Goal: Hit the target with your car three times in a row.**

# Bull's Eye Experiment Data Chart

*Objective: Hit the bull's-eye with the vehicle in the shortest time.*

Attempt number:	How far did your vehicle go?	Did you hit the bull's-eye?	How high was the top of the ramp?	How fast did it hit the bull's-eye?
1				
2				
3				
4				
5				
6				

# I Have, Who Has Vocabulary Review

- Teach vocabulary. Use important terms frequently and give learners opportunities as well
- Create game cards using template (handout)
- Start with first card.
- Exchange cards, start again.
- Add new challenges, e.g., timed trials.



# I Have, Who Has?



I have the first card.

I have **inclined plane**

Who has **inclined plane**?

Who has **screw**?

I have **screw**.

I have **pulley**.

Who has **pulley**?

Who has **lever**?

I have **lever**.

I have **wheel and axle**.

Who has **wheel and axle**?

Who has **wedge**?

I have **wedge**.

I have **wedge**.

Who has **nation**?

Who has **work**?

I have **work**.

I have **push**.

Who has **push**?

Who has **forces**?

I have **forces**.

I have **friction**.

Who has **friction**?

Who has **gravity**?

# Summary:

## Brace Map Showing Whole to Part

Scaffolding Language and Content  
in Science  
with Thinking Maps

- Hands-on experiences to connect to previous experiences
- Cooperative experiences to motivate and promote social learning
- Mapping analysis and connecting to cognition with thinking maps
- Enhancing discussion by introducing language of science
- Opportunities to describe, analyze orally
- Language frames to support writing and oral reports
- Rich and varied experiences with vocabulary

# The Pulley and the Pendulum: Thinking Maps for ESOL Science

Marjorie Cooper

[marjoriecooper@globalvillageproject.org](mailto:marjoriecooper@globalvillageproject.org)

Mary Lou McCloskey

[ml@mlmcc.com](mailto:ml@mlmcc.com)

The Global Village Project

[www.globalvillageproject.org](http://www.globalvillageproject.org)

Handouts: [www.mlmcc.com](http://www.mlmcc.com)